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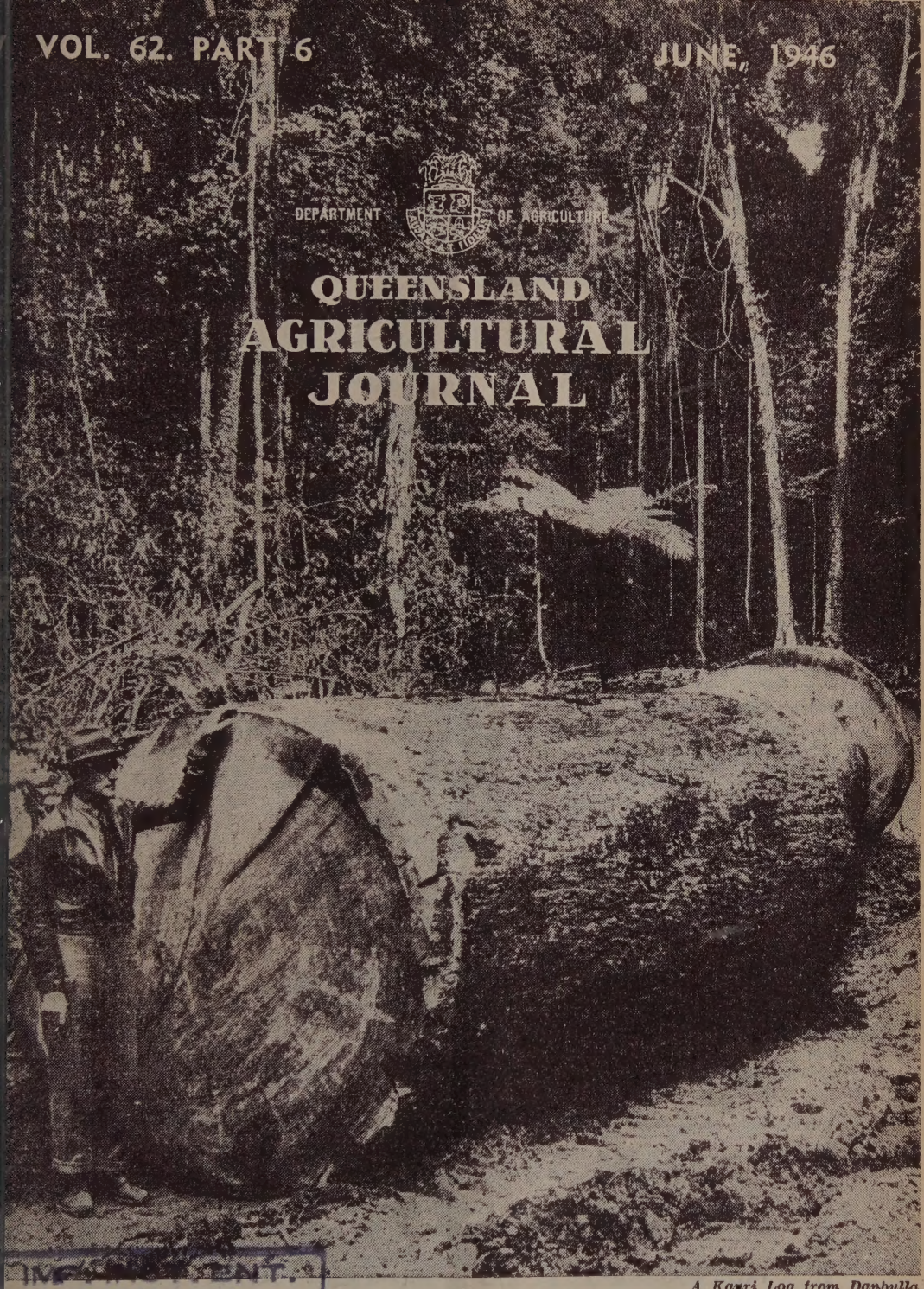
DEPARTMENT OF AGRICULTURE

QUEENSLAND AGRICULTURAL JOURNAL



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Commercial Cotton Varieties for 1946-47
Soil Preparations and Transplanting of Tomatoes
Pests of the Peanut Crop
Percentage of Butterfat in Cream
Practical Duck-keeping
Phenothiazine for Treatment of Worms in Cattle

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Volume 62 Part 6

QUEENSLAND AGRICULTURAL JOURNAL

Edited by
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C. W. WINDERS, B.Sc.Agr.

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QUEENSLAND AGRICULTURAL JOURNAL

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Event and Comment.

Feeding and Breeding for Dairy Production.

SPEAKING as a dairy farmer when opening the Beaudesert Show, the Minister for Agriculture and Stock (Hon. H. H. Collins) said that the remedy for low production of butter per cow was in better feeding and breeding. Until a cow got an abundance of the best feeds known to animal husbandry one did not quite know what she was capable of producing and could only form an approximate idea of her capacity. Better feeding was the starting point. Two of the best feeds were maize and lucerne, and both could be produced abundantly in the Beaudesert district. Regarding wheat, oats, barley and sorghum, the need was to produce more of those crops, use the cow for harvesting them and the butter and bacon factory for processing them. Poultry raising also could be considered as an economic combination, as food for fowls was available to the farmer at first cost.

Continuing, Mr. Collins advocated the growing of more lucerne where, as around Beaudesert, soil and climate were suitable for an expanded acreage. Where a dry spring was the usual experience, the production of pasture plants, which grew so well in the southern parts of the continent under conditions of winter rainfall, might be impracticable. But maize, lucerne, and sorghum for silage could be grown, especially as dry-time fodder reserves. If fodder crop cultivation and storage were more generally practised seasonal declines in dairy production would largely cease as a recurring anxiety. The Minister added that he had noted with pleasure that two progressive farmers of the Beaudesert district had bought machines for harvesting maize and sorghum for silage, in the use of which very little labour was involved. He suggested that such commendable enterprise could be further encouraged by district butter factory directorates purchasing similar

machines for doing the job for other farmers at cost price. If the objective of more butter per cow per acre were generally adopted in mixed farming areas, he believed that extraordinary results would be achieved. Butter production, for instance, could soon be increased by at least half as much again without milking more cows, or using more land—only using it in a practical way. His Department offered farmers its co-operation in their efforts to attain such an objective. "We want to assist you. We must work together," concluded the Minister.

Water Supply Investigations.

IN a recent statement on the work of the Bureau of Investigation set up under the *Land and Water Resources Development Act*, the Minister for Lands (Hon. Arthur Jones) stressed the importance of the development of underground water resources. Investigations into these potential supplies were already proceeding under the direction of the Bureau in the Lockyer, Logan, Albert and Condamine Valleys. Similar surveys had been undertaken in the Dawson, Callide and Burnett Valleys from which valuable information had been gained. Mr. Jones added that extensive surveys to determine the available underground water and its quality were proposed by the Bureau, so as to supplement any possible surface storages or even to serve where no surface water was available. He pointed out that surface storage was subject to enormous loss through evaporation, but by tapping underground water for irrigation such waste was relatively negligible.

When developing irrigation projects dependent on subterranean supplies, Mr. Jones continued, it was most important to determine the safe yield, namely, the annual extraction which would not be more than the average annual recharge, thus so lowering the water table that the permissible cost of pumping was exceeded, or the intrusion of water of undesirable quality permitted. This determination was not easy but the Bureau was giving close attention to this factor in its plans for the development of underground water resources. The farming districts first surveyed were the Lockyer and Bremer Valleys where an aggregate of 22,000 acres was under irrigation. In recent years the number of farmers using irrigation had increased considerably and a large volume of water was drawn from gravel beds adjacent to the rivers.

The Minister added that the weiring of the Lockyer was under way, but before a complete scheme could be formulated it was necessary to inquire into the availability not only of the open waters, but also of the underground supplies; also the rate of their replenishment, so that the quantity of water which might be safely pumped from the area might be determined. This would indicate the extent to which the irrigation of additional available land, perhaps 20,000 acres, might be safely practised. The extent of fresh supplies was being measured, and it was interesting to note that 15,000 acres under irrigation used only 16,000 acre feet of water last year. The ultimate irrigated acreage in districts such as the Lockyer would depend on the rate of replenishment which, with limited basins, was a matter of major importance. It would be risky to engage in a large irrigation scheme until the re-storage rate was known. Weirs served not only to hold open water in streams, but to retard the escape of underground water or to replenish the supply. The problems of the Lockyer basin were considered typical of those likely to be met with in other parts of Queensland where underground supplies were adjacent to open water.

Commercial Cotton Varieties Recommended for the 1946-47 Season.

R. W. PETERS, Plant Breeder.

THE climatic conditions which operated over the main cotton belt during the 1945-46 season, whilst not so severe as the previous one, were sufficiently variable to test severely the yielding abilities of the main commercial varieties being grown, and, from the results obtained, sound recommendations can be made for seed distribution for the 1946-47 cotton planting season.

The importance of a farmer growing the most suitable variety for his conditions cannot be overestimated, and to assist him the following recommendations are made as a guidance when ordering seed that will be distributed from the Glenmore and Whinstanes ginneries respectively.

Seed Distribution from Glenmore Ginnery.

The Miller variety has once again shown its general suitability for the districts which receive their planting seed from the Glenmore ginnery. Broadly speaking, the strain lot 41S of this variety appears to be well suited for the heavier soils of these areas under either rain grown or supplementary irrigation conditions. On the very fertile heavier alluvials lot 39, which is a slightly more open type, may occasionally yield better than lot 41S. Where there is danger of attacks of the leaf sucking jassid, it is advisable to plant lot 1, which is a new jassid-resistant strain especially evolved out of Miller for such areas. Its staple length is slightly shorter than both lots 41S and 39 but its ability to produce appreciably heavier than either of these strains under conditions of severe jassid infestation makes it a valuable cotton for districts where jassids occur in most seasons.

The New Mexico Acala variety has again demonstrated that it is a good cotton for the alluvial loams and sandy loams, particularly when grown with supplementary irrigation. Under the very dry late summer and autumn conditions, the strength of some consignments of this cotton grown without irrigation on the lighter soils indicated, however, that it is highly desirable to have ample supplies of subsoil moisture in such soils at the time of planting this variety to ensure good sound fibre of 1 to $1\frac{1}{16}$ inches in length being produced. New Mexico Acala should not be planted where there is any likelihood of jassid occurring in serious numbers, as it is one of the varieties most susceptible to attack by this insect.

No other variety appears to be required in the districts south of Mackay which receive their planting seed from the Glenmore ginnery, other than on the fertile alluvial soils of the coastal strip from North Bundaberg to Mackay. A quicker-maturing cotton than either Miller or New Mexico Acala is required on such soils and Triumph lot 39–1 is recommended for such conditions

Seed Distribution from Whinstanes Ginnery.

The Lone Star variety has once again demonstrated that it is the outstanding cotton for growing on the harder, less fertile soils of the forest slopes in the Upper, Central and South Burnett and in the West Moreton districts. It has also proved to be the most successful variety on all soils save those of the softwood scrub series of the Northern Darling Downs and Maranoa districts. In the former districts lot 24 should be ordered, while in the last two areas lot 33S—a very hardy type—has yielded well over several years.

Miller lot 41 appears to be the most suitable variety for the fertile soils of the upper slopes of the forest and scrub country in all of the districts supplied from the Whinstanes ginnery; except where jassid may be anticipated, when lot 41J, a partially jassid-resistant strain, should be ordered as it has substantially out-yielded lot 41 under even moderate jassid attacks.

New Mexico Acala has again yielded well on the lower forest slopes of the South Burnett and West Moreton districts. It has shown a tendency, however, to produce rather soft cotton where unfavourable conditions have been encountered. This appears to be a weakness of this variety and in conjunction with its extreme susceptibility to attacks by jassid makes it advisable for farmers who usually grow this cotton on forest slopes to try either Miller 41 for the less fertile soils or Triumph lot 39–1 for the fertile soils.

Qualla is a big-boll, hardy variety that has yielded very satisfactorily in recent years when planted on the poorer sandy loams and sandy clay loams of the forest slopes in the West Moreton district. This appears to be about the most suitable cotton for these soils that has been tested and it is recommended that farmers with such types of soil give this variety a trial during the coming season, for it produces fibre of excellent quality. It is not suited to the fertile alluvial or scrub soils, however, where it makes vigorous growth under all but extremely droughty conditions.

Rowden, another big-bolled, hard-bodied cotton, somewhat similar to Lone Star but with a finer framework, less vegetative development and quicker fruiting, has given excellent results over the past few years. The most suitable soil type for it would be either a forest or scrub slope, where there is danger of Miller becoming too rank and vegetative, and where Triumph would be likely to suffer from short periods of heat wave and drought conditions.

Triumph.

This variety, with the exception of one commercial strain, has again, in only a moderately good season, shown its ability to yield well and to produce good quality fibre. The exception is lot 39–4 strain which, though

yielding well in the Upper Burnett, produced weak fibre and for this reason, and the fact that more suitable strains are available to replace it, the whole strain is being discarded.

Lot 39–1 strain of this variety produced good yields this season in all districts where it was grown. It would appear that this cotton is well suited for the alluvial flats and the fertile lower slopes of both the forest and scrub country in the Upper and South Burnett districts and on similar soils in the West Moreton.

Lot 39–7, which is of a more open habit of growth than lot 39–1, appears well suited to the fertile alluvials of the Central Burnett and growers with such soils should order it for both rain grown and supplementary irrigation conditions.

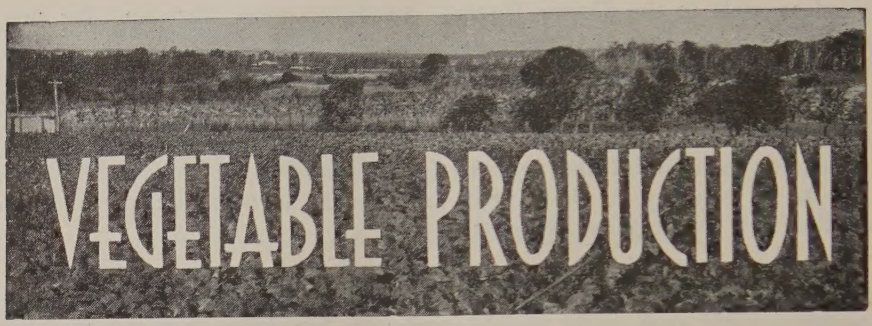
Lot 39–2 is a slightly more vigorous type than any of the above-mentioned Triumphs, and should prove most suitable for any slopes either forest or scrub not having the fertility required for lot 39–1, yet too fertile for the more robust varieties of Miller or Lone Star. The boll size of this strain is the largest of all the Triumphs.

Grow Only One Variety.

The Queensland Cotton Board has advised that in order to simplify the receival and identification of cotton arriving at the ginneries, seed of only one variety will be distributed to a grower. Each season a percentage of the growers plant more than one variety in order to have the most suitable cottons for their different soil types. This procedure not only complicates arrangements for districts to produce pure planting seed but also increases the operations connected with receiving and ginning a grower's cotton. Most farmers can undoubtedly benefit by selecting only one variety to grow on their most suitable soils for cotton and, if reasonably satisfactory returns are obtained from it at first, repeatedly growing it. In this way a farmer can determine the full possibilities of a variety for his soil—particularly if efficient cultural practices and correct row and planting spacings are carefully ascertained.

It is therefore recommended that, where a grower has obtained reasonably satisfactory results with a variety, he order seed of it for the coming season, making sure to specify the same lot number of the variety, such as Miller lot 41S and not just Miller, of which there are several strains. In some instances the district Adviser in Agriculture may desire a new strain of the same variety to be grown in order to increase the seed for general distribution in subsequent seasons. Growers should assist in this work, for only well tested strains are so released.

Wherever possible a group of farmers with comparable conditions should grow cotton on the community one variety system. By concentrating on learning how to grow to the best advantage the selected variety on their most suitable soil, the farmers will get better returns than are realised when varieties are changed yearly. This particularly applies if cotton is grown in rotation with grassland as each season provides additional evidence of the improvement in yields and quality of cotton that can be produced with this rotation.



Soil Preparations and Transplanting of Tomatoes.

C. N. MORGAN, Horticulture Branch.

WHEN preparing the soil for growing tomatoes, it should be borne in mind that tomatoes are deep-rooted and after transplanting may occupy the ground for a period of up to five to six months. It is essential, therefore, to prepare the land with great care, if satisfactory results are to be assured.

If the land required for the tomatoes carries a cover crop, such as maize, a legume or weeds, it will be necessary to plough some time prior to the time it is desired to plant, in order to ensure that this vegetable matter is well rotted. The period required for the breaking down of this material varies with the time of the year and type of crop. During warm wet weather, decomposition is comparatively rapid, and young maize or Poona pea may break down in a matter of a few weeks. On the other hand, if the maize is old or the cover crop is composed of big clumps of crowsfoot grass, or the like, it will take considerably longer. During the colder months the process is much slower than during the rest of the year, and then it is essential to allow from two to three months to elapse between the first ploughing and the planting.

Tomatoes, unlike cabbage or cauliflowers, do not transplant well into soil full of vegetable matter, which, not having decomposed, has prevented the ground from settling down to reasonable firmness. For this reason, too, it is necessary to ensure that enough time has been allowed between the initial ploughing and time for planting out. Unless the vegetable cover is well rotted, not only is it impossible to have the land in good physical condition, but the decomposing material can render much plant food unavailable to the crop plant and this can prove very detrimental. When unavoidable delay has occurred, a rotary-hoe may be used before ploughing. This will help considerably in soil preparation, as the hoe cuts the cover crop into small pieces and mixes them with the soil, thus accelerating decomposition.

The land should be ploughed deeply, 8 to 10 inches usually being satisfactory, and allowed to weather until a few weeks before planting when it should be well ploughed again and then brought to good tilth with disc cultivators or harrows.

Before planting out, the land may be drilled out with a plough or other suitable implement, the drills fertilized and the fertilizer well mixed with the soil by using a scuffler.

TRANSPLANTING.

Prior to selection of the plants, it is as well to withhold the water from the seed beds for a day or two in order to harden them off slightly, as plants from seed beds overwatered or after excessive rains do not transplant well, even where irrigation is used.

Plate 108.
WELL-GROWN PLANTS BEFORE PRUNING.—Note good root development.

The day chosen for transplanting should, if possible, not be too hot, but, if this is unavoidable, all planting should be done in the afternoon. This applies particularly to farms where there is no irrigation. An hour or so before lifting the plants, the seed bed should be well watered to make sure that the plants can be removed with the least possible injury to the roots (Plate 108). The plants should then be trimmed ready for planting, by removal of all leaves except the crown (Plate 109) and then placed in a bucket of soil and water puddle or between wet bags. This trimming of the leaves lessens transpiration and minimizes wilting after transplanting. All undesirable plants should be discarded and the remainder more or less graded to size, if there is any great variation in this respect. The selection for size can be done to a large extent when choosing the plants from the seed bed, as it is often found that some portions of the bed have grown better than others. The remaining smaller plants left in the bed will very often improve in size rapidly, and allow of a planting a week or so later if necessary. The crown of plants should be kept as free of dirt as possible.

When setting the plants in the field, it is advisable to put them at least three inches deeper than they were in the seed bed. This enables the plants to root deeply and helps to keep them rigidly upright. The hole for planting may be made by hand or trowel, and should be sufficiently deep to allow the roots to fit without cramping.

Plate 109.
PLANTS PRUNED READY FOR PLANTING.

As soon as practicable after the plants are set out they should be watered, each plant receiving a pint to a pint and a half of water. This ensures that the soil becomes well settled around the roots and that the plant will not lack for moisture over the rather important and critical period between seed bed and becoming established as a field crop. Care in transplanting is very well worthwhile; replacements are unsatisfactory. Therefore, only good well grown plants which can be handled satisfactorily over the requisite period of time should be taken from the seed bed. Straight rows assist subsequent cultivation and care should therefore be given to this point when planting out.

PLANTING SYSTEMS AND PRUNING.

The systems adopted for growing tomatoes in Queensland are:—

(1) Grown naturally on the ground without any mechanical support;
(2) Grown on a low cradle;
(3) Trellised; and
(4) Staked.

With staked crops the plants are pruned of all lateral growth. The laterals—marked "A" in Plate 110—arise at the leaf axils and around

Plate 110.

SHOWING THE MAIN STEM OF A TOMATO PLANT AND ILLUSTRATING THE METHOD OF PRUNING. ALL SHOOTS MARKED "A" SHOULD BE REMOVED.

the base of the plant. They should be removed at least once every week or ten days during the growing season. In the case of trellised tomatoes which carry two stems, the lateral immediately below the first flower cluster is allowed to remain in order to form the second arm of the plant, but subsequent laterals are removed (Plate 111).

Plate 111.
SHOWING THE METHOD OF TRAINING FOR TRELLISED PLANTS.

Pruning should be done by breaking out the shoots, not cutting or pinching them out, as there is a danger of spreading disease by these latter methods. When the plants reach the top of the trellis or stake, the growing tips may be broken out if desired.

Ground Crops.

In Queensland, more tomatoes are grown as ground crops than by any other method, particularly in areas where there is no irrigation and ample ground is available. It is only in the Redlands and metropolitan areas where trellising or staking is practised extensively.

Ground crops are much cheaper to plant and maintain than crops grown by the other methods, but losses from blemishes, diseases and pests are much greater, particularly in the winter months. The bushy ground crops give far greater protection from sunburn, which is most desirable early or late in the season, than the trellised crops. Varieties such as Pearson and Pritchard are not very adaptable to trellising and may be considered suitable only as ground crops.

Planting distances vary for the the different districts—e.g., Bowen growers plant much wider apart than do growers in the Redlands or metropolitan area. Distances are influenced by variety, irrigation facilities and in some cases wind.

Plate 112.
AN EXCELLENT GROUND CROP OF RUTGERS AT WELLINGTON POINT.—Note compact bush.

A usual distance is 6 feet between rows and 2 feet 6 inches to 3 feet between plants in the row for varieties such as Break-o'-Day. More upright types such as Pearson or Pritchard may be planted closer. Closer planting in the rows has the advantage that plants grow together quickly and are thus not blown about so much as they would be individually. From 1,500 to 2,000 plants to the acre for ground crops should give a wide enough range to cover most conditions.

Plate 113.
YOUNG PATCH OF RUTGERS, PLANTED 6 FEET X 2 FEET 6 INCHES.

LOW TRELLIS TO AVOID PRUNING.

Fig 1. Top Cross Arm 24" x 1½" x ½" made of sawn hardwood with hole bored for wire pin and sawn slots in each end.

Fig. 2. Lower Cross Arm 12" long and otherwise similar to the top arm.

Fig. 3. Dropper 3' 3" long x 2" x 2" bored about 2" from top and 15" further down. Pointed at the bottom end and driven about 12" into the ground.

Fig. 4. Wire pin about 6" long made from 10 or 12 gauge wire and used for pinning Cross Arms to Droppers.

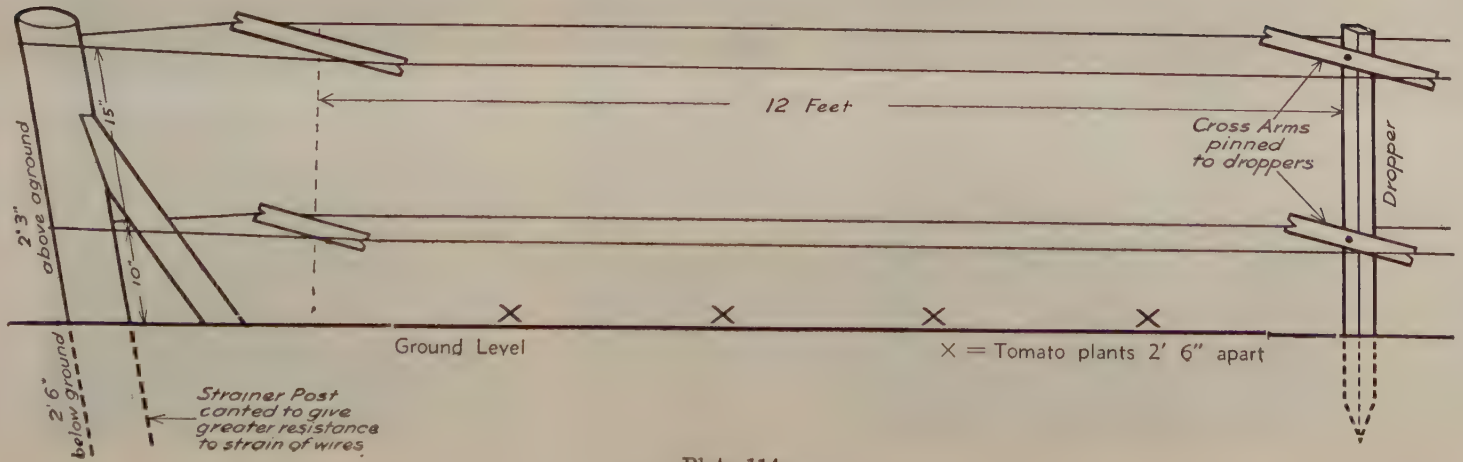


Plate 114.
DRAWING OF CRADLE.

Cradle.

This method of growing tomatoes was popular some years ago in the Redlands area, but is not used so extensively as formerly, and trellising is now much more widely practised. It is of advantage during the autumn months, particularly for the thick bushy types of tomatoes which are not easily adaptable to pruning, as it keeps the plants up off the ground; consequently, much fruit is saved which otherwise would be lost in a ground crop. It is not as difficult to apply dusts or sprays to cradled plants as to ground grown ones and they are much easier to harvest. No pruning is required. The method of construction is as follows.

Plate 115.
Method of Planting and Training Plants on Cradle.

At each end of the cultivated field place short hardwood posts 2 feet 6 inches in the ground and 2 feet 3 inches high (4 feet 9 inches over all). These should be set at a slightly backward angle and be well stayed, to better stand the weight on the wires of the vines and fruit. Five feet is sufficient to allow between each row. Hardwood droppers (Plate 114, fig. 3) 3 feet 3 inches in length should be placed in line and driven into the ground every 12 feet so that the actual height is 2 feet 3 inches, thus corresponding with the strainers at each end. Each dropper should have two holes bored through it—one almost at the top, and the other about 15 inches below the first. These holes need be only of ordinary nail-bit size (No. 5), being big enough to carry a short wire pin made from No. 10 or 12 gauge galvanised or steel wire. The wire pins (Plate 114, fig. 4) carry the cross-arms. The top cross-arm (Plate 114, fig. 1) should be 2 feet by 1½ inches by ½-inch sawn hardwood with a centre pin-hole and a ½-inch sawn slot in each end. Two top wires are run from either side and very near the top of the strainers. Similarly, two wires are run from either side of the strainers at about 10 inches from the ground. The wires are strained tight, the cross-arms placed in position, and attached to each dropper with a wire pin, which is then bent over.

The plants are planted between the wires, spaced about 2 feet 6 inches to 3 feet apart (approximately 3,000 plants per acre). The first laterals are spread over the lower wires, and the later laterals over the top wires, and allowed to grow towards the ground again.

Trellising.

Trellising of winter and spring tomatoes is general throughout the Redlands area and this method has much to commend it. Although there is a lot of work involved in the early stages—such as putting up posts, wires, and strings, and then training the plants—there are other factors which balance this. The fruit is of better quality and it is easier to pick, dust, spray and irrigate. In comparison with those from ground crops at this period of the year, losses in trellised crops from blemishes and disease are cut to a minimum.

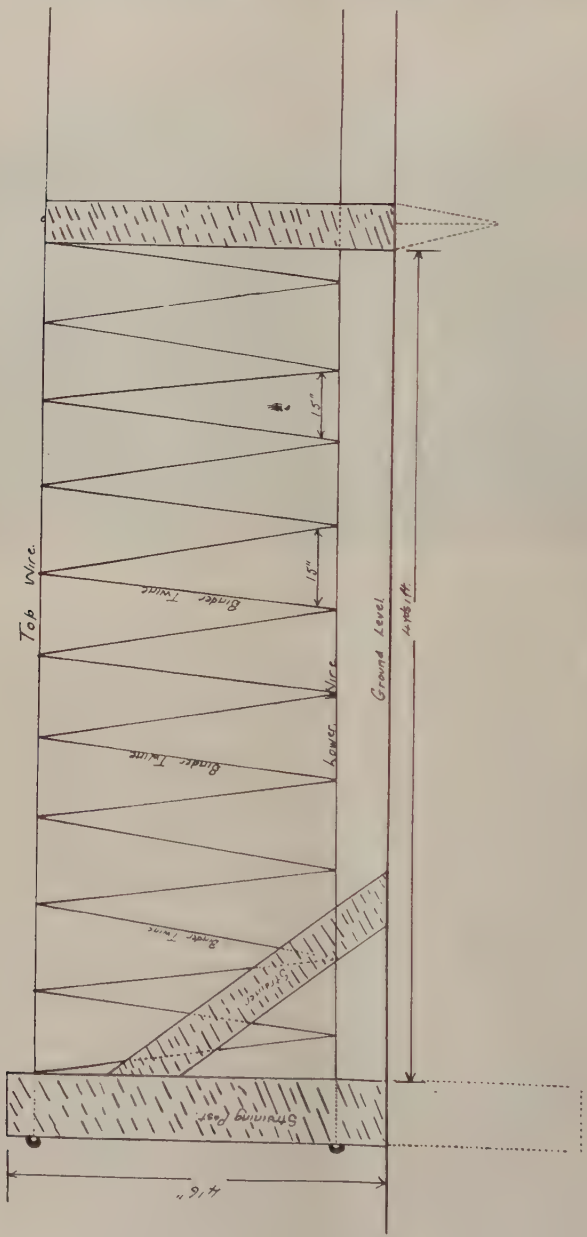


Plate 116.
METHOD OF CONSTRUCTING TRELLIS.

Many varieties of tomatoes are unsatisfactory in the winter because of faulty pollination, and Salads Special and others of this type, which usually crop well under winter conditions, are recommended. Because of their small fruit, these are most unsuitable as ground crops, but are most satisfactory for trellising, the pruning of all surplus growth ensuring fruit of good size.

Two methods of trellising are in common use. The first as shown in Plate 116 is constructed as follows. Two strong posts of about 7 inches diameter and 7 feet long are set firmly in the ground to a depth of 2 feet 6 inches at the ends of each row and firmly stayed. The rows are spaced 4 feet 6 inches apart. Between the posts, strong hardwood stakes are driven into the ground every 12 feet to act as intermediate supports; the end posts are bored at about 9 inches and 4 feet 6 inches above the ground level to carry two 12½ gauge wires. The wires are tightly strained and stapled. The trellis is then completed by tying the end of a ball of binder twine to the top wire and passing the ball down under the bottom wire and back over the top wire to form a "V" pattern, as shown in Plates 116 and 117. The bottoms of the "V" should be 15 inches apart, the distance the plants are in the rows.

Plate 117.

SHOWING COMPLETED TRELLIS BY PASSING TWINE UNDER AND OVER WIRE.

The young plants are set out immediately under each "V" and the arms trained up each piece of twine. Some growers cut the twine to the required lengths and tie each end separately (Plate 118).

Both methods are quite satisfactory and as there are other methods which can be used it would be advisable for the grower to find out which is the more suitable to him.

Another satisfactory method of trellising which varies slightly from that described above is as follows. Holes are bored at the ends of the rows with an 8 inch soil auger to a depth of 3 feet at an angle of about

Plate 118.
SHOWING TRELLIS WHERE TWINE IS CUT TO REQUIRED LENGTHS AND TIED.

60 degrees (Plate 119) and a post of about 7 inch diameter and 8 feet long dropped into the hole. There is no need to stay these posts. The posts are bored at 4 feet 6 inches and 9 inch levels and 12½ gauge wire strained through them. The intermediate supports consist of a small post of about 4 inch to 5 inch diameter and 6 feet 6 inches long, set firmly into the ground every 22 yards to a depth of 2 feet. Between the posts are four hardwood droppers which are allowed to rest on the ground. The top wire is stapled to the tops of droppers and intermediate posts whilst the bottom wire is stapled to the sides. This is a good trellis, being very firm and strong. The method of putting on the twine is the same as described for the previous method of trellising. If the staples are not driven in too far they are easily removed at the end of the season and may be used again. A seven pound ball of twine will do approximately seven chains of trellis. Planting 15 inches apart in rows 4 feet 6 inches apart allows approximately 7,000 plants to the acre.

Staking.

Staking has been replaced by trellising in most districts, and growers who prefer the former method are few. Hardwood stakes about an inch square and 6 feet 6 inches to 7 feet long are driven into the ground to allow at least 5 feet above the ground level, from 15 inches to 18 inches apart in rows 4 feet 6 inches apart. One plant is placed at each stake and pruned to a single stem. The stem is tied to the stake every 12 to 15 inches by binder twine.

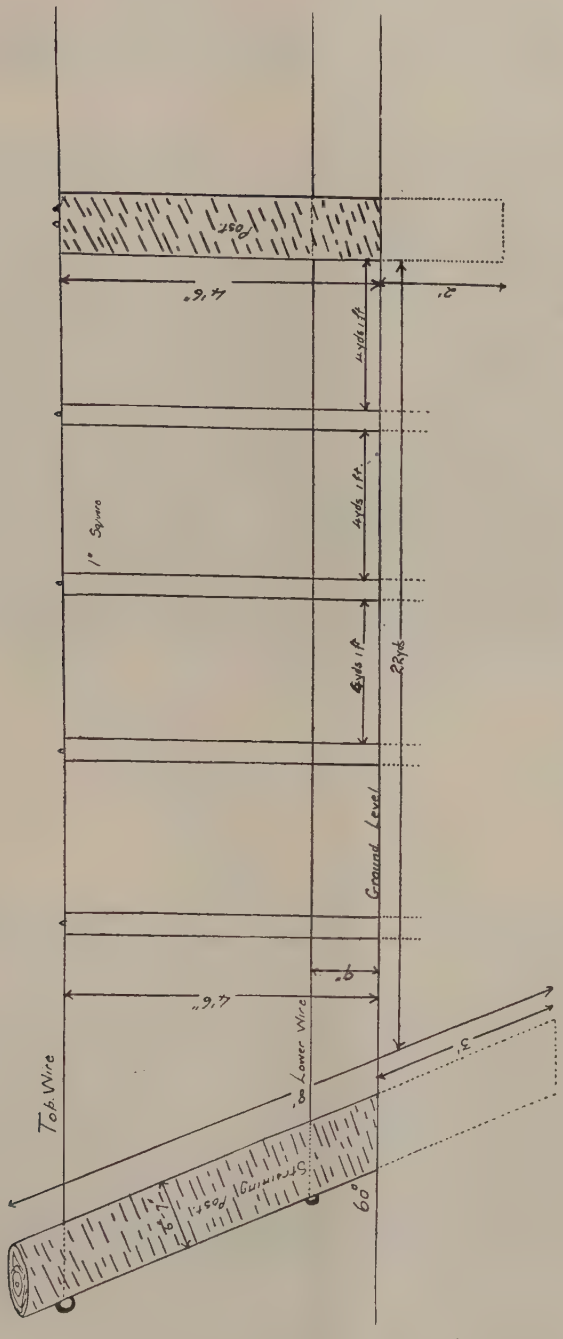


Plate 119.
SECOND METHOD OF CONSTRUCTING TRELLIS.

The ties are made loosely so that they do not cut the stem, and are placed under a leaf if possible, but this is not absolutely necessary. The method of tying is to pass the twine around the stem (see Plate 120) crossing it over and passing around the stake twice before knotting. An

easy method of hammering the stakes is to use a piece of two inch pipe about 2 feet 6 inches long, with a plug in one end. The stake is placed in position, the pipe slipped over the top and by moving it up and down in pile driver fashion, it will rapidly drive in the stake.

Plate 120.
SHOWING METHOD OF STAKING.

IRRIGATION.

Many tomato crops are grown without irrigation throughout Queensland during the autumn months and during the spring and summer months in the Stanthorpe district.

In the Redlands and metropolitan areas, however, where the soil dries out rapidly, it is rarely that a season is experienced where a crop can be grown to perfection without irrigation. There are two methods in use, namely furrow and overhead irrigation.

The former is used only on properties where the slope and type of the soil are suitable for lateral movement of the water. If the soil is very sandy or porous, it is almost impossible to supply enough water to reach the end of a row of reasonable length. If the slope is too steep,

Plate 121.
FURROW IRRIGATION IN TRELLISED TOMATOES.

the water will run to the end of the furrow without penetrating sufficiently to wet the soil thoroughly. On the other hand, on land which is too flat the intake end of the furrow is overwatered long before the water reaches the distant end.

Plate 122.
FURROW IRRIGATION SHOWING USE OF HOSE ON IRRIGATION STANDARDS.

One great advantage of the furrow method is that it avoids excessive wetting of the plants with consequent increase in disease, or washing off of dusts or sprays, necessitating more frequent application of fungicides and pest destroyers.

Once the pipes are set up, overhead irrigation does not require the same amount of attention as does the furrow type, and also has the advantage of giving a more complete covering of the ground, thus ensuring a better root spread.

Plate 123.
OVERHEAD SPRAY IRRIGATION.

Plate 124.
SHOWING STANDARDS AND PIPE OF OVERHEAD IRRIGATION.—In many cases rubber hoses are used to connect overhead pipe to low standards.

It should be remembered that excessive watering by either method is distinctly harmful. When the first inch or two of surface soil appears dry, many growers immediately apply heavy irrigation, but, it should be remembered the tomato is a deep-rooted plant and draws much of its moisture requirements from six to nine inches below the surface. Examination of the position with respect to water should therefore be made several inches below the ground surface. Constant wetting of the ground, especially during winter months, is not conducive to good growth and heavy cropping.

CULTIVATION.

If the ground for the tomato crop has been well ploughed and thoroughly prepared, there is no need for deep cultivation at any stage during the growing period. It has been proved with most crops, including tomatoes, and on most types of soils, other than very sandy ones, that the only benefit derived from cultivation is the control of weeds. Therefore, shallow cultivation, if done when the weeds are small, will do all that is required and be much safer than deep cultivation. Deep cultivation, in most cases, injures the rooting system of the plant, particularly with trellised crops as there is always the temptation to cultivate as close to the plants as possible in order to save chipping. Ground crops are probably not so seriously affected, as the growth after a few weeks does not allow the scuffler to come in too close.

When top dressing, which is usually done with a water soluble fertilizer, many growers plough a deep furrow alongside the plant, fertilize this furrow, and then plough another furow over this so that this fertilizer is well covered with soil. This is not necessary, however, for the first rain, or irrigation, will dissolve the material and carry it down to the roots of the plant. If it is desired to mix the fertilizer with the soil, this should be done by light cultivation. The opening of a deep furrow alongside the plants, particularly when they are starting to set fruit, will probably do much more harm than can be compensated for by the addition of the fertilizer.

If growers wish to hill up the plants slightly they should do so as soon as the plants are big enough, which will be a few weeks after planting out.

"BUCK" PLANTS.

In quite a number of varieties of tomatoes, plants occur which are known as "buck" plants.

When young these plants are much sturdier than the others, and have short internodes, small leaves and numerous laterals. It has been recorded that they may have as many as 20 to 30 laterals with distorted flower clusters, even when only 6-8 inches in height. They do not crop satisfactorily and bear small numbers of misshapen fruit, almost unrecognisable as to variety. There has been no satisfactory explanation as to why the "buck" plants appear. Experienced growers soon learn to pick the "buck" plants from the good, even while they are still in the seed beds and only three to four inches high. When these "bucks" are noticed after planting out they should be removed immediately and replaced with a good plant. If allowed to remain, there is a chance that a grower, when saving his own seed,

will include some of the fruit from them. It has been reported that varieties subject to "buck" plants may produce up to 20 per cent. of these, but such a high percentage has never been noticed in Queensland. One method of guarding against this trouble is to obtain seed from reliable sources only. Growers who have selected their seed carefully over a period of five or six crops have practically eliminated this nuisance.

The varieties grown in Queensland which show "buck" plants are Salads Special, Walker's Recruit, Planter's Favourite and Australian Dwarf Red.

SAVING SEED.

Many growers save their own seed from year to year. This practice is recommended, but it is necessary that certain precautions are taken to make sure that:—

1. The variety is true to type;
2. Plants are free from disease; and
3. Selection of individual plants is made in the field.

A number of plants should be selected and marketed early in the season and checked carefully throughout the life of the plant. They should be vigorous, and carry fruit typical of the variety, in good quantity and average size throughout the crop and be free from disease. If a tomato shows a good first hand only, and the remainder are not satisfactory, do not be tempted to choose the few good fruit. The plant should be rejected altogether as a source of seed.

Fruit for seed should be allowed to colour on the vines and become fully mature before being picked. Remember that as it is possible to improve a variety by careful selection so it is possible to lose it by choosing fruit indiscriminately!

A suitable method for the preparation of seed is as follows:—Take the fully ripened fruit, cut in halves and squeeze the pulp into a barrel or galvanized bucket. Place the receptacle under cover and allow the pulp to ferment for four to five days. Do not add water, as this will probably check fermentation and may even cause the seeds to shoot, which they will not do in their own juice. When fermented sufficiently, the pulp and seed may be put into a sieve and washed thoroughly under running water. This will clean the seed of all pulp. The seed should be spread out on clean hessian or bags and dried in the shade. After drying, the seed should be rubbed briskly to break the clumps, and then stored in suitable air-tight containers for future use. A half-bushel case of fruit will give approximately 1 ounce of seed.

THE COUNTRYMAN'S SESSION

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PLANT PROTECTION

Pests of the Peanut Crop.

J. HAROLD SMITH, Senior Entomologist.

SINCE the commencement of peanut growing on a commercial scale in Queensland, the activities of insect pests in the crop have, from time to time, attracted attention. Compared with some other cultivated crops in the more important agricultural districts, the toll taken by insects in peanuts is relatively light. Some species are, however, important pests which can cause considerable damage. They are pea mite, white grubs, brown scarab beetle, crown borer, corn ear worm, green vegetable bug and mealy bugs. Two minor pests are red shouldered leaf beetle and a small Scarabeid beetle.

PEA MITE OR BLUE OAT MITE.

A critical period in the life of a peanut crop occurs shortly after germination, for the rainfall may then be light and climatic checks to growth accentuate the effects of any injury caused by the pea mite or blue oat mite. This species is well known as a minor pest of cereals on the Darling Downs but, since 1942, it has also been recorded as attacking peanuts in the South Burnett district, where the crop is grown extensively. A general yellowing of the leaves is the earliest field symptom in affected plants followed, if the mites are numerous, by a slackening in the growth rate and by a shedding of the lower leaves. Should the attack last for several weeks, some of the young plants die and the final stand is uneven. The mites are easily disturbed, but, if the plants in an infested field are approached carefully and examined from a distance of one or two feet, small, blackish spots can be seen on the leaves. Each of these spots is a pea mite and large numbers sometimes occur on a single plant. At the commencement of an outbreak, the injury is more or less confined to small groups of plants, though later the pest spreads very rapidly throughout the field.

Life History and Habits.

The pea mite* has a very wide distribution both in Australia and overseas. The adults are approximately one-thirtieth of an inch in length, oval in shape, and blue in colour except for the legs, which are bright red. The mites lay their orange-red eggs on the upper surface of the leaves—usually singly, but sometimes in groups of three or four. The immature mites emerging from these eggs are very similar to the adults in appearance though much smaller in size. Like the adults, they feed mainly on the upper surface of the leaves and contribute to the overall damage produced by the pest. As a rule, the mites are seen

* *Penthaleus major* Duges.

most easily during the late afternoon when feeding takes place; earlier in the day, they shelter towards the base of the plant and few are visible on the leaves. Outbreaks of the pest usually occur during spring and early summer and are less serious when monsoonal rains stimulate rapid growth of the crop.

Control.

In field practice, insecticides are seldom, if ever, employed for the control of the pea mite. Under some conditions, however, treatment may be desirable, for if the pest is checked at the right time a uniform stand of plants may be assured. Should treatment with an insecticide be considered necessary, good results can be expected from a dust containing 3 per cent. nicotine, which gives efficient control of a related species in the Southern States, known as the red-legged earth mite. Two applications of the insecticide at an interval of 10 days would probably prove effective in controlling the pest.

WHITE GRUBS.

Peanuts are grown extensively on friable, volcanic, red soils in which white grubs tend to be active and it is therefore not surprising that damage to the crop by these pests has been reported on a number of occasions in several parts of the State. Usually, the affected crops had been sown in newly broken-up grassland. In such cases, the pastures were already infested by the grubs and those insects which survived the tillage operations turned their attention to the cultivated peanut crop. Typically, the strike in such grub infested areas is satisfactory

Plate 125.

SCARABAEID BEETLES.—The beetle on the right is *Rhopaca magnicornis* Blk., natural size.

and growth proceeds normally for some weeks. Then at any time between November and February, plants collapse and die in patches here and there throughout the field. Examination shows that the tops of these plants have been severed from the roots by one or more white grubs feeding at a depth of from one to three inches beneath the surface of the soil. The end of the severed stem of a collapsed plant is swollen and this character is diagnostic even when the insects themselves cannot be located. White grub attacks tend to be local in their incidence and the same farm may be infested from year to year.

Life History and Habits.

These white grubs are the immature stages of large, heavy-bodied, brown, scarabaeid beetles* (Plate 125), which frequently attract attention during their flight period between November and January. The species involved in white grub damage to peanuts varies from district to district, but the habits of all are similar. During the summer flight period, the beetles lay their relatively large, white eggs in the soil, where they hatch within three weeks. The small larvae emerging from them feed, to some extent, on the smaller roots of living plants. The damage caused by the young grubs is not important unless populations are abnormally high. Twelve months later, however the insects are in the final larval stage and they then feed voraciously on the roots of peanut and other plants. At this stage, the grubs measure from one and a-half to two inches in length and are curled in shape; the hind segments, which are much darker than the rest of the body, are somewhat distended. Larval development is completed in approximately sixteen months and the insects then burrow deep into the soil and pupate in earthen cells. Beetle emergence does not occur until early summer, usually after the onset of storm rains.

Control.

White grub pests with a two-year life cycle are seldom troublesome in permanent cultivation paddocks planted to annual crops such as maize, grain sorghum or peanuts each year. This is primarily due to the fact that little egg-laying takes place in fallow land or land carrying very young plants when the beetle flights are in progress. Consequently, should previous experience or the proximity of a farm to infested areas suggest that white grubs may be a problem, the grower may lessen the risk of attack by planting the peanut crop on land which has been under cultivation for at least one, and preferably two or more years. If Rhodes grass is a constituent part of the farm rotation, the peanut crop would automatically precede the establishment of the pasture. These cultural recommendations for white grub control, however, should not be practised in areas free from the pest; normally peanuts grown in newly broken up grassland yield good crops.

BROWN SCARAB BEETLE.

The brown scarab beetle is related to the species implicated in white grub damage to peanut crops but, unlike them, it is injurious only in the adult stage. Outbreaks of this pest are seldom extensive but plants in limited areas may be destroyed by the beetles feeding two or three inches below ground level and severing the tops of the plants from their roots. The attacked plants die and may be removed easily from the soil. One or more beetles can usually be found among the roots of each plant if a search is made for them as soon as the damage is observed in the field.

Plate 126.
BROWN SCARAB BEETLE × 2.

* *Rhopaea magnicornis* Blk. is an important species in Southern Queensland.

Life History and Habits.

This thick-bodied, brown beetle* (Plate 126), which measures about ¾ inch in length, is a minor pest of many cultivated crops. Like some other insects in the group to which it belongs, its legs possess horny projections that facilitate the movement of the beetle in the soil. The larval stages of the brown scarab beetle are of the white grub type, and occur in soils rich in organic matter as well as in compost heaps; they have not been recorded as injurious to living plants.

Control.

Insecticides are usually of little value for the control of such pests as the brown scarab beetle in field crops. Moreover, they would be essentially protective and their use could be justified only if outbreaks occurred each year in the same district and the probable losses warranted considerable expenditure on control measures.

CROWN BORER.

Crown borers occasionally cause serious damage in peanut crops, for infested plants in the field wilt and die in the later stages of their development. When these plants are examined, it is found that the interior of the crown has been completely hollowed out by beetle larvae, which measure from one-half to one inch in length. A single larva is sufficiently destructive to kill an infested plant, but two or even three may be present in the same crown. The tunnels occupied by the larvae extend for some distance into the root, and the damage is such that nutrients cannot flow from leaves to roots and vice versa.

Life History and Habits.

The identity of the insect or insects responsible for crown borer damage to peanuts is uncertain because the larvæ tunnelling in the plants have not been bred to maturity. The appearance of the immature stages of the insects suggests, however, that they belong to one or other of two longicorn beetles† associated with leguminous crops. These beetles have rather similar habits and the lucerne crown borer may be cited as a representative species. The adult stage of this insect measures approximately five-eighths of an inch in length and has light-orange wing-covers ornamented with black spots which occasionally merge into transverse bands. The eggs are presumably laid in the lower part of the stem, for the young larvae are usually found in the above-ground portion of the plants. These larvae feed in the pith of the stem and burrow downwards into the crown and roots. When full-grown they are elongate in shape, white in colour, and characteristically constricted between the body segments. The head is wider than the body, this being a normal character of the group to which they belong. Pupation takes place in the larval tunnels usually at or below ground level, and the adult beetles later escape from the pupae. The length of the life cycle has not been determined but probably extends over a period of from three to four months.

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* *Isodon puncticollis* Macl.

† The suspected insects are *Zygrita diva* Thomps., the lucerne crown borer, and *Sybra centurio* Pasc.

Control.

The control of stem borers in peanuts cannot be achieved by the use of insecticides and the only practicable method of reducing infestation is to effectively destroy crop residues after harvesting. These may be burned, a procedure which kills any larvae and pupae contained within the root or crown of the plants.

CORN EAR WORM.

Leaf-eating caterpillars are often present in peanut fields and the damage caused by them is, at times, readily observable because they feed on the foliage which, as a consequence, becomes very ragged in appearance. The injured plants are infested with pale-green, greenish-brown, or dark-brown caterpillars, two or three of which may be seen on the leaves of each infested plant, but more particularly on the younger leaves near the growing point. Sometimes the insects burrow into the tip of the plant, thus causing the growing point to collapse, and the caterpillars also injure the stem and flowers. Attacks usually occur when the crop is eight to ten weeks old and the first-formed nuts are filling.

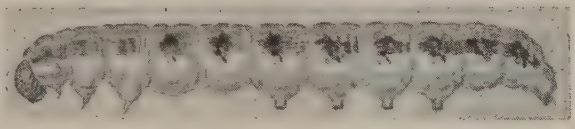


Plate 127. [*Drawing by William Manley.*
CORN EAR WORM × 2.

Were such attacks to continue for any length of time, the crop wastage would be serious. Fortunately, however, they seldom last for more than three weeks and, if growing conditions are good, infested crops make a quick recovery, though the nuts may fill out rather slowly. Frequently the damage is restricted to those parts of a field in which plant growth is most vigorous.

Life History and Habits.

The corn ear worm*, a cosmopolitan pest which feeds on a wide range of both cultivated and wild plants, is the most important caterpillar pest of peanuts. The parent moths measure about one and a half inches across the outstretched forewings, which are greenish-gray in colour and often tinged with red. The hind wings are creamy-yellow with a smoke-coloured outer margin. The globular, creamy-white eggs, which are about half the size of a pin-head, are laid by the moths singly on the foliage of the peanut plants and from them small, whitish larvae later emerge to feed on the leaves. Growth proceeds through a series of moults and, in the later stages of development, the larval colour varies from pale-green to dark-brown with green, yellow, brown, and black markings. The full-grown larvæ (Plate 127) are approximately one and a half inches in length when they leave the plant and enter the soil to pupate in earthen cells at depths of from one to three inches.

* *Heliothis armigera* Hb.

Transformation from the pupal to the adult stage takes place inside the earthen cells from which the moths later force their way above ground. The whole life cycle may extend over four weeks in the summer months and there are usually five generations during the year.

The moths are attracted strongly to tasselling maize, and to some other crops such as lucerne and cotton, all of the three host plants mentioned being preferred to peanuts. The presence of these crops in the immediate vicinity may therefore create local conditions favourable for an attack on the peanut crop.

Control.

Outbreaks of corn ear worm and other leaf-eating caterpillars in peanuts seldom, if ever, require the use of insecticides for their control. Attention, however, should be paid to cultural measures which can be expected to keep their numbers at a low level. Weeds, such as the pig weeds and bull head, on which these insects breed, should be suppressed in cultivated areas by the regular use of implements. Furthermore, within the limits imposed by the farm rotation, peanut crops should be planted at the greatest possible distance from the preferred hosts mentioned above. The latter practice is particularly desirable if a spring crop of maize is sown on the farm, for the presence of this crop very often determines corn ear worm abundance in January and February, i.e., when the peanuts are growing freely.

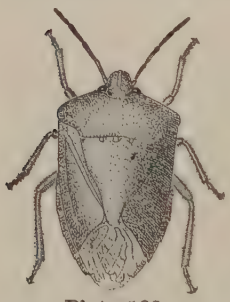


Plate 128.
GREEN VEGETABLE BUG
× 2.
[*Drawing by Wm. Manley.*

GREEN VEGETABLE BUG.

The green vegetable bug, which is a common pest of market gardens, occasionally invades peanut crops in large numbers. Though the bugs feed on peanuts in both the adult and immature stages the damage caused by them is not great, even in the more spectacular outbreaks. They are readily seen, particularly when mating pairs are numerous and the vividly coloured immature bugs are clustered together on the leaves. The injury to the plants caused by this pest includes the collapse of terminals following feeding on the upper part of the stem. Such injury stimulates the development of axillary buds and the subsequent growth of the plants is somewhat bunched. Infested crops seldom react seriously to the pest and yields have apparently not been adversely affected in the outbreaks so far recorded.

Life History and Habits.

The green vegetable bug* (Plate 128) is an introduced insect which is now established in most parts of the State. The adult bugs are approximately one-half of an inch in length, shield-shaped, and pale-green in colour. Though capable of flight they do not readily take

* *Nezara viridula* L.

to the wing, and therefore can be caught easily by hand. Their barrel-shaped eggs are laid in masses on the under surface of the leaves and are at first white in colour but they turn pink shortly before the young bugs emerge from them. The newly hatched bugs are blackish in colour and usually remain in the vicinity of the egg masses for a few days before dispersing over their host plants. They moult several times as growth proceeds, each succeeding immature stage being larger and somewhat lighter in colour than the one preceding it, until they finally reach the pale-green, winged, adult stage. Several generations may be completed during the year and the adults over-winter in sheltered situations on the farms and in adjacent timbered country. Outbreaks of the green vegetable bug occur at infrequent intervals but they may last for several months. In peanut crops, the pest has, so far, attracted attention only when district-wide outbreaks were at their peak.

Control.

Control measures for the green vegetable bug have not been required in peanut crops, because the injury inflicted by the pest in these crops has always proved less important than the threat implied by the presence of high green vegetable bug populations in the field. This may be due, in part, to the activity of an egg parasite* which was introduced some years ago to help combat the green vegetable bug. However, should the use of insecticides be considered necessary, a D.D.T. spray, used at a strength of 0·2 per cent, should give good control if it is applied when plant injury is apparent and the inward migration to the crop has been completed.

MEALY BUGS.

Mealy bugs are seldom important pests in the deep, red loams normally used for peanut growing, but plants at the lower end of poorly drained slopes may show characteristic symptoms of infestation. The infested plants are stunted and make little response to summer rains. Dense colonies of these small, meal-covered insects will be found on the underground portion of such plants, but occasionally the mealy bugs penetrate above ground and cluster round the base of the stalk. They are particularly numerous on the nuts, which often collapse and assume a blackish colour when the mealy bugs are present in large numbers.

Life History and Habits.

Colonies of the mealy bugs† infesting the roots and stems of peanut plants include all stages of the insect, full-grown specimens of which are about one-tenth of an inch in length and are covered with a flour-like, mealy substance. The body is fringed with waxy filaments, those at the hind end of the body being very long. Though capable of movement, they rarely change their position unless

* *Microphanurus basalis* Woll.

† *Pseudococcus* sp.

compelled to do so by the drying-out of their host plants. The young stages of the mealy bug found on peanut plants are generally referred to as crawlers because they move about freely and are primarily responsible for the establishment of new colonies on the same or adjacent plants. These crawlers are similar in appearance to the adults but are much smaller. The reproductive capacity of mealy bugs is high and under suitable conditions—chiefly a moist environment and an adequate supply of food—populations increase very rapidly. All stages of this insect feed through sucking mouth parts and the resultant loss of sap, when the mealy bugs are present in considerable numbers, impoverishes the attacked plants and causes the stunting which is sometimes observed in the field.

Control.

Outbreaks of mealy bugs tend to be most severe in ant-infested land because some ants feed on mealy bug secretions and aid the establishment of new colonies by carrying the crawlers from one plant to another. These ants are more numerous near buildings and on soils fringing rivers and creeks than in the undulating country on which peanuts are generally grown. The exercise of care in selecting land for peanuts can therefore lessen the risk of damage by mealy bugs, for crops planted on well-drained, gentle slopes should escape infestation.

Plate 129.
RED-SHOULDERED LEAF BEETLE × 7.
[*Drawing by Hubert Jarvis.*

MINOR PESTS.

Two other pests sometimes injure peanut crops, but the damage inflicted by them is seldom of economic importance, even though the defoliation for which they are responsible may be appreciable.

The first of these minor pests is the red shouldered leaf beetle* (Plate 129), a small insect which measures three-sixteenths of an inch in length and is light-yellow in colour with a reddish band across

* *Monolepta rosea* Blk.

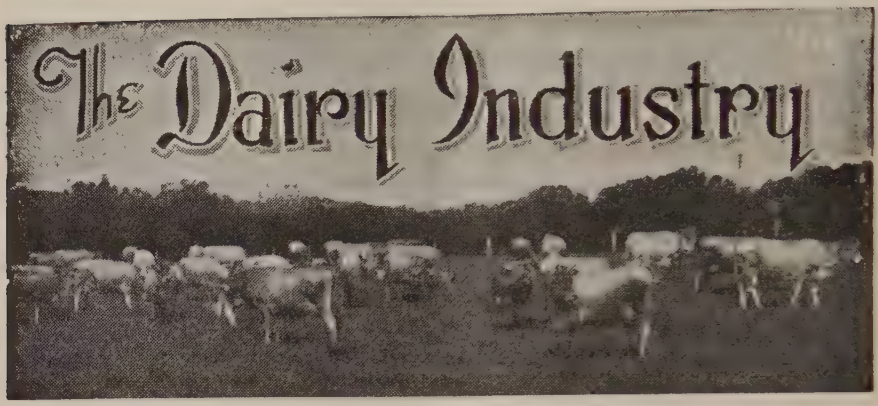
the base of the wing-covers. Occasionally, dense swarms of this insect suddenly invade a crop and settle in it in restricted areas where they feed on the foliage. The effect of such an attack may be spectacular, for the leaves have a scorched appearance and indeed many of them may have been destroyed by the beetles. Should it be necessary to combat these swarms, they may be dispersed by applications of a nicotine dust; when so dispersed, the overall damage to the crop is of no consequence.

The second minor pest produces effects similar to those associated with red shouldered leaf beetle infestation but the swarming habit in this case is less characteristic and foliage injury is more evenly distributed throughout the field. The species is a small scarabeid beetle*, measuring about one-quarter of an inch in length, which is uniformly brown in colour and somewhat oval in shape. Large numbers of this beetle may be seen on the wing in some parts of the State between November and January. The injury for which they are responsible is seldom sufficiently serious to warrant the application of control measures.

* *Heteronyx brevicollis* Blk.

Plate 130.

ON THE EUNGELLA RANGE ROAD, NORTH QUEENSLAND.



Percentage of Butterfat in Cream.

C. R. TUMMON.

QUEENSLAND dairy legislation specifically requires that farmers' cream received at butter factories shall contain not less than 38 per cent. butterfat in summer months nor less than 34 per cent. during the winter months.

Questions asked frequently by farmers are "Why is it desirable to supply cream with a butterfat content above these margins; and why should it be lower in winter than in summer?"

In answering these questions, the following factors must be considered:—

1. Economic aspect.
2. Churnability of cream.
3. Keeping quality of cream.

Economic Aspect.

As the cartage paid by farmers for the transport of cream from farm to factory is on a gallonage basis, it will readily be seen how a saving is made by supplying cream of a high fat percentage over that of a low percentage, when a greater quantity of cream would be forwarded. Another possible saving factor is that fewer cream cans need be used. This can be quite important as the initial cost of cans of suitable type is considerable and through constant use and rough handling, the cost of maintenance—repairs and retinning—may also amount to a surprising figure if taken over a number of years.

Churnability of Cream.

There are nine commonly recognised fats in butterfat with varying melting points. These fats are:—

Olein, Palmitin, Stearin, Myristin } glycerides of insoluble and non-volatile fatty acids.

Butyrin, Caproin, Caprylin, Caprin, Laurin } glycerides of soluble and volatile fatty acids.

Certain factors influence the relative proportions of fats present; for instance, the foods eaten by milking cows.

In summer when the heavy rainfall is a usual experience in Queensland dairy districts, there is a prolific growth of soft, succulent pasture available for cows, which produces a greater proportion of softer fats than the winter months. During the winter, the feed is usually of a hard, dry nature and hand feeding is to some extent practised. All this has a tendency to produce a preponderance of harder fats. The "churnability" of cream, which means the ability to convert the cream into butter during the process of churning, is affected by the relative proportion of high to low melting point fats in the cream to be churned. The experienced buttermaker has to make certain variations in manufacture—such as in cooling temperature of water and time taken to churn—for cream during different times of the year. This is the reason why a lower fat per cent. is allowable in winter than in summer.

Moreover, this standard of fat percentage has been set down after thorough investigation by laboratory methods, and expert practical buttermakers have proved that the least losses in fat in butter manufacture occur if cream of the desired fat percentage is delivered. Rich cream churns easier than low testing cream, with less buttermilk and consequently less loss of butter.

Another advantage is that standardization of cream to a percentage of approximately 34 per cent. butterfat may be achieved. This process of standardization becomes easier if there is little variation in fat percentage of cream. The actual standardization of cream is very desirable if a factory hopes to turn out a uniform quality and textured butter throughout the year.

Keeping Quality of Cream.

It may sound rather far fetched at first to say that cream of a high fat percentage should keep better than cream of a low fat percentage. However, such is the case and it is attributable to several causes. Firstly, bacterial development is more rapid in the constituents of milk other than fat, than it is in the actual fat itself. Secondly, when cream is separated at a low test, usually an undesirable amount of skim milk finds its way through the cream spout into the cream can. This, of course, greatly accelerates the bacterial growth by providing a more suitable medium for them. There are certain types of organisms which do thrive best in cream and are sometimes the cause of the development of a rancid flavour, but provided dairy methods are reasonably sound it may be confidently expected to produce a better keeping quality cream with a 40 per cent. test than with a 30 per cent. test.

One might ask: Why not therefore produce cream of a very much higher test than the minimum standard? This may be explained by the fact that certain fat losses in churning occur if cream of a very high fat percentage is churned through rapid break of the butter, and the method of estimating the amount of commercial butter which could be made from a farmer's cream would be more prone to error, and as a result of this slight inaccuracy the farmer's return would be slightly underestimated and he would be a loser. It may be

easily seen then that it is equally necessary not to supply cream of a very high fat percentage (nothing over 47 per cent.) as it is not to supply cream below the butterfat standard.

The farmer may alter his cream screw to bring about the correct tests for winter and summer months.

There are many causes of variations in cream tests, some of which are within the power of the farmer to control, and some of which are not, such as changes brought about by the animals themselves.

Device for Inspecting Milk Tubes.

S. A. CLAYTON, Dairy Officer.

ON dairy farms on which milking machines are used particular care is necessary to ensure that the machines are kept in the cleanest possible condition. One of the worst sources of bacterial infection of milk will be found in the rubber tube which connects the claw to the metal milk line.

Some dairymen, apparently afraid of scoring the inner surface of the tube, make a practice of merely washing these tubes. Others use the familiar brush, which, it must be admitted, may score the rubber surface if the wire end of the brush is sharp.

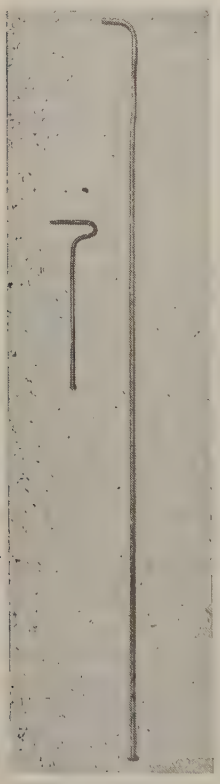


Plate 131.
CLEAVERS FOR MILK TUBES.

A cleaver (Plate 131) for these tubes, made by the writer, has proved very efficient in use. An old metal cream stirring rod was dismantled and the large stirring disc replaced with a smaller disc or washer of such a diameter that it would fit with moderate tightness into a milk tube. The shaft was long enough to enable the disc to be forced through the full length of each tube and withdrawn in the reverse direction. If the edges of the disc are approximately sized without being sharp or rough, there is no danger of injuring the rubber and the cleaning action is most effective.

In recent series of trials with this device it was found that even the most conscientiously cleaned machines may be found to have dirty milk tubes. Half the number of machines so far tested have been found faulty in this respect. In some cases thick curd has been removed from the tube, while in other cases where soda has been used as a cleaner a brown granulated paste was found adhering to the inside of the tube.

The device described is so simple and cheap to make and performs such valuable service that it would be worthwhile for every dairy farmer who uses a milking machine to have one. There is no reason why a similar tool of smaller size should not be made for cleaning and inspecting the smaller tubes which connect the teat cups to the claw.

PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock which qualified for entry into the Advanced Register of the Herd Books of the A.I.S., Jersey, Guernsey, and Ayrshire Societies, production records for which have been compiled during the month of April, 1946. (273 days unless otherwise stated.)

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORN.				
Mature Cow (Standard, 350 lb.).				
Glenroy Judy	H. L. and C. I. Bruggemann, Kulpi	11,959·7	462·639	Parkview Glider
Boah Peak Pet 3rd	H. L. and C. I. Bruggemann, Kulpi	11,881·15	424·556	Glenroy Admiral
Navillus Nancy	E. W. Jackson, Nobby	10,326·5	403·390	Westbrook Midget Sheik
Springleigh Pearl 3rd	H. F. Moller, Boonah	8,865·6	362·585	Burradale Ronald
Alfa Vale Beauty 3rd	H. G. Watson, Killarney	9,786·7	359·726	Alfa Vale Peter
Senior, 4 Years (Standard, 330 lb.).				
Springleigh Buttercup 18th	H. F. Moller, Boonah	9,184·6	394·464	Springleigh Robin
Aurora Fortune	H. L. and C. I. Bruggemann, Kulpi	8,892·65	370·253	Blacklands Maidor
Junior, 4 Years (Standard, 310 lb.).				
Penrhos Bounce 2nd	Sullivan Bros., Pittsworth	8,780·43	344·428	Penhros Sovereign
Senior, 3 Years (Standard, 290 lb.).				
Euroa Marion 11th	P. R. Emery, Dallarnil	10,418·45	368·765	Dualwon Sceptre
Rhodesview Lincoln 4th	W. Gierke, Helidon	8,705·85	343·601	Fairvale Major
Mount Camp Thelma 32nd	Madge Bros., Southbrook	8,529·35	341·453	Trevor Hill Reflection
Junior, 3 Years (Standard, 270 lb.).				
Ennismore Rose	E. W. Jackson, Nobby	8,193·5	337·871	Navillus Prince Henry
Rhodesview Nancy 49th	W. Gierke and Sons, Helidon	8,715·75	330·087	Fairvale Major
Sunlit Farm Amy 6th	W. H. Sanderson, Mulgeldie	8,693·8	318·057	Sunlit Farm Spider's Emblem
Trevor Hill Lola 2nd	G. Gwynne, Umbiram	7,882·54	310·382	Alfa Vale Reflex
Valera Roseleaf 13th	Sullivan Bros., Pittsworth	6,171·78	274·315	Alfa Vale Pride 2nd
Senior, 2 Years (Standard, 250 lb.).				
Rhodesview Kitty 23rd	W. Gierke and Sons, Helidon	9,332·4	379·451	Fairvale Major
Corunna Oliva	A. H. Webster, Helidon	7,303·5	309·370	Corunna Supreme
Sunnyview Bess 15th	A. Lohse, Degilbo	7,267·2	305·254	Sunnyview Kitchener
Sunnyview Miss Mona	A. Lohse, Degilbo	6,823·8	253·747	Sunnyview Envoy

PRODUCTION RECORDING.—continued.

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORN.				
JUNIOR, 2 YEARS (STANDARD, 230 LB.).				
Bingleigh Rosette 2nd	J. C. Meier, Grandchester	8,380·08	376·426	Blacklands Jean's Victory
Valera Roseleaf 16th	Sullivan Bros., Pittsworth	8,270·18	324·989	Alfa Vale Pride 2nd
Valera Roseleaf 15th	Sullivan Bros., Pittsworth	6,744·86	292·088	Alfa Vale Pride 2nd
Rhodesview Nancy 56th	W. Gierke and Sons, Helidon	6,744·2	289·525	Alfa Vale Nigel
Applegarth Roan Calm	R. A. Shelton, Monto	7,232·05	281·513	Applegarth Paramount
Sunlit Farm Flower 4th	W. H. Sanderson, Mulgeldie	7,069·45	274·426	Sunlit Farm King Billy
Alfa Vale Judy 17th	V. R. Nugent, Murgon	6,760·25	261·706	Alfa Vale Pat
Sunlit Farm Ida 6th	W. H. Sanderson, Mulgeldie	6,477·55	242·582	Sunlit Farm King Billy
JERSEY.				
MATURE COW (STANDARD, 350 LB.).				
Westwood Goldilocks	F. Porter, Maleny	9,597·85	593·299	Hunstrete Emperor's Volunteer
Kathleigh Royal Mayflower	F. W. Kath, Dalby	9,446·4	509·944	Retford Royal Atavist
Strathdean Fay	S. H. Caldwell, Bell	8,202·93	484·611	Navua Ladora's Ruler
Westwood Lily	F. Porter, Maleny	9,902·8	482·053	Hunstrete Emperor's Volunteer
Westwood Silverleda	F. Porter, Maleny	8,439·2	467·890	Stretton Carnation's Volunteer
Rush Princess (imp.)	Estate J. Sinnamon, Moggill	8,656·15	466·421	Rush Fern Oxford Junior
Westwood Sunshine	F. Porter, Maleny	7,194·5	439·591	Stretton Carnation's Volunteer
Sunny Glen Princess	J. S. McCarthy, Greenmount	7,424·0	427·165	Brasseldale Duke
Westbrook Sylvia 5th	Farm Home for Boys, Westbrook	7,572·0	396 648	Oxford Aster's Lad
Hamilton Retford's Hope	J. Wilton, Killarney	8,239·3	387·243	Retford May's Victor
Trecarne Dairymaid 4th	T. A. Petherick, Lockyer	7,053·8	353·711	Jerseylea Golden Duke
SENIOR, 4 YEARS (STANDARD, 330 LB.).				
Trinity Cute Princess	J. Sinnamon and Sons, Moggill	10,362·19	546·645	Samares Cute Prince 3rd (imp.)
Trinity Mariette's Sunbeam	J. Sinnamon and Sons, Moggill	7,595·55	367 635	Samares Cute Prince 3rd (imp.)
Westwood Heather	F. Porter, Maleny	5,730·6	333·659	Westwood Palatine Volunteer
JUNIOR, 4 YEARS (STANDARD, 310 LB.).				
Strathdean Gem	S. H. Caldwell, Bell	10,716·87	619·380	Strathdean Xenia's Lad
Brooklands Cunning Drop	W. S. Conochie, Sherwood	10,888·8	529·331	Engloric Cunning Victor
Strathdean Marvelette	S. H. Caldwell, Bell	7,860·1	512·767	Navua Ladora's Ruler
SENIOR, 3 YEARS (STANDARD, 290 LB.).				
Westwood Silverbell	F. Porter, Maleny	8,337·4	511·551	Westwood Brown Victor
Trinity Crowning Duchess	J. Sinnamon and Sons, Moggill	8,803·5	463·554	Trinity Crowning Effort
Glenview Royal Hawthorn	C. A. Edwards, Alderley	7,043·06	365·366	Trinity Royal Prince
Gem Maudette	C. A. Edwards, Alderley	6,352·75	314·362	Bulby Oxford Gamboge

JUNIOR, 3 YEARS (STANDARD, 270 LB.).					
Hocknell Bravo Girl	N. C. Webb, Beaudesert	8,962·1	437·087	Navua Victoire Lad
Trinity Graceful Lady	J. Sinnamon and Sons, Moggill	8,897·0	433·281	Trinity Crowning Effort
Windsor Lady Gladys	Johnson Bros., Gleneagle	8,554·45	418·748	Brookland Sultan's Victory
Westwood Peggy	F. Porter, Maleny	6,955·75	409·919	Westwood Palatine Volunteer
Trinity Princess Royal 2nd	J. Sinnamon and Sons, Moggill	6,884·18	402·657	Trinity Crowning Effort
Trinity Princess Rose	J. Sinnamon and Sons, Moggill	6,641·32	368·272	Trinity Lily's Lad
JERSEY.				
SENIOR, 2 YEARS (STANDARD, 250 LB.).				
Trecarne Jersey Hope 2nd	J. J. Ahern, Conondale	7,538·75	416·752	Trecarne Some Duke
Lermont Marie	J. Schull and Sons, Oakey	6,789·6	342·659	Selsey Samares Hallmark
Lermont Joyful 2nd	J. Schull and Sons, Oakey	5,162·55	306·363	Selsey Samares Hallmark
Strathdean Dolly	S. H. Caldwell, Bell	5,024·87	272·926	Navua Ladora's Ruler
JUNIOR, 2 YEARS (STANDARD, 230 LB.).				
Lermont Kitty 2nd	J. J. Ahern, Conondale	6,941·1	384·310	Selsey Samares Hallmark
Glenview Xenia's Watfern (258 days)	F. H. Sippel, Murgon	8,354·75	359·369	Trinity Governor's Hope
Mayfair Ettie 3rd	J. W. Carpenter, junr., Helidon	5,556·5	300·830	Trecarne Golden King 2nd
Trinity Diamond Wedding	J. Sinnamon and Sons, Moggill	5,242·16	281·7	Trinity Crowning Effort
Trinity Effort's Royal	J. Sinnamon and Sons, Moggill	5,497·06	275·913	Trinity Crowning Effort
Austral Park New Princess	A. Semgreen, Coolabunia	5,375·55	271·780	Austral Park Nice Lad
Glenview Princess Superior	F. H. Sippel, Murgon	6,591·9	265·117	Trinity Royal Prince
Pinegrove Bluebelle's Pride	J. W. Evans, Rosewood	4,431·04	264·686	Glenview Victor
Trecarne Pealing 4th	C. Huey, Sabine	5,341·5	262·027	Trecarne Some Duke
GUERNSEY.				
SENIOR, 2 YEARS (STANDARD, 250 LB.).				
Willowbrae Mate	A. S. Cooke, Maleny	5,543·25	261·591	Linwood Peace Boy
JUNIOR, 2 YEARS (STANDARD, 230 LB.).				
Willowbrae Marygold	A. S. Cooke, Maleny	6,697·5	320·833	Linwood Peace Boy
AYRSHIRE.				
SENIOR, 4 YEARS (STANDARD, 330 LB.).				
Myola Miss Jean	J. R. Ruhle, Motley	7,958·12	375·363	Myola Bosca
SENIOR, 3 YEARS (STANDARD, 290 LB.).				
Leafmore Bonnie Lass 2nd	J. P. Ruhle, Motley	8,013·07	354·308	Myola Bessemer

By J. J. McLACHLAN, Poultry Adviser.

IN Queensland, ducks are chiefly kept for table purposes, although some small flocks are kept for egg production. There are, however, few specialized duck farms. The market for table birds is usually fairly well supplied, but high values are not regular, though always firm for the Christmas trade.

A duck egg is equal to a hen egg in food value, and, provided the birds are given good wholesome food and kept under strict sanitary conditions, it would be difficult to distinguish any difference in general quality. Some breeds are more prolific layers, have a longer profitable life, usually more easily reared, and freer from disease than other poultry.

BREEDS.

The foremost breed is the Muscovy which is essentially a table bird. The Muscovy is distinct from all other breeds of ducks and will always remain distinct, for if this breed is crossed with any other breed the progeny will be "mule" ducks. Other heavy or table breeds are Pekin, Rouen and Aylesbury. Light or laying breeds comprise mainly of Indian Runners and Khaki-Campbell.

THE MUSCOVY.

General Characteristics.

Head: Rather long; in drake, large the top covered with long crest-like feathers, which are elevated or depressed by the specimen when it becomes excited or alarmed; sides of head and face covered with caruncles—the larger, the better.

Bill: Rather short, of medium width.

Eyes: Of medium size having slightly over-arched socket.

Neck: Of medium length, well-arched.

Wings: Very long, stout.

Back: Long, broad, somewhat flat.

Tail: Rather long, with abundance of stiff plumage.

Breast: Broad and full.

Body: Long, broad; carriage nearly horizontal.

Legs and Toes: Lower thighs, very short, large; shanks, short, large; toes straight, connected by web.

Colour.

The Black and White.

Head: Plumage glossy black and white.

Bill: Pink, shaded with horn.

Eyes: Brown.

Face: Caruncles, red.

Neck: Black, may be slightly marked with white.

Wings: Fronts, white; bows, black intermingled with a number of white feathers; primaries, black with white feathers permissible; secondaries, black; coverts, rich, lustrous, greenish-black.

Back: Lustrous, greenish-black.

Tail: Black.

Body and Breast: Lustrous, greenish-black, broken with white—the blacker the plumage, the better.

Legs and Toes: Lower thighs, black; shanks and toes, varying from yellow to dark lead.

The White.

Bill: Pinkish flesh colour.

Eyes: Blue.

Face: Caruncles, red.

Shanks and Toes: Pale orange.

Plumage: Web, quill, and fluff of feathers in all sections, pure white.

Weight: Drake, 10 to 12 lb. Ducks, 5 lb. to 7 lb.

Plate 132.
A TYPICAL MUSCOVY DUCK.

Serious Defects.

All Varieties: Any breed defect or deformity.

Coloured: Smooth heads; plumage more than one-half white.

The White: Smooth heads; feathers other than pure white in any part of plumage, except dark markings on heads of young specimens.

INDIAN RUNNER.

General Characteristics.

Of the egg-producing ducks, the Indian Runner predominates in numbers. But the Khaki-Campbell is becoming very popular and is equal as a layer, whilst it is slightly heavier in body weight than Runners.

Plate 133.
WHITE INDIAN RUNNER DUCK.—Note upright carriage which is characteristic of this breed.

Head.—Fine and somewhat flattened over the skull, with the eyes full, bright and clear, showing alertness, and situated high up in the skull. Bill strong and deep at the base where it joins and fits almost insensibly into the skull, and thence comes as nearly as possible straight down to the tip, giving it a wedge-shaped appearance of good average length.

(*Note.*—The shape is more important than actual length or width, and it should be proportionate to the build and size of the bird and well set into the head at the junction. Very flat or dished bills with rounded under-line are objectionable, and abnormally long heavy bills are liable to be accompanied with coarse heads and thick necks, which are serious faults.)

Neck.—Neck very fine, thin and slender to where it begins to form the expansion towards the base of the neck, which expansion should fit almost insensibly into the upper part of the body, so as to appear almost part of it, the head and neck carried high and slightly forward, and not curved or carried swan-like.

Body.—Body—the lower portion of the neck expansion is included—long and narrow, of nearly uniform thickness, very tightly feathered. Wings closely packed; approximately about twice the length of the neck to the top of the head. When standing erect, the stern appears comparatively short and curves round to the tail, which is close and neat, and in the best specimens carried nearly in a line with the body, but in some excellent birds it is slightly elevated or turned upwards, and a fullness of the lower stern is frequent in the most prolific layers.

Plate 134.
A KHAKI-CAMPBELL DRAKE.—A Prolific Laying Breed.

Legs.—Legs placed much farther back than in the other breeds of domestic ducks. Shanks comparatively short, with small supple feet and strong thighs to enable the bird to balance properly and maintain an upright position when on the run.

Length and Size.—As layers of a great number of large eggs, substance and constitution are necessary in the breed; small, square specimens are useless, while heavy bulky birds are less active as foragers

and open to the same objections. A medium size with good reach and perfect symmetry is advisable, but appearance and activity should be a truer guide than actual weight and measurements.

Carriage.—In comparison with other ducks, the body is more tightly feathered and appears longer and thinner, and this impression is heightened by the remarkable erect carriage and the fact that the bird when on the alert carries its neck and body almost in a line at an angle of from 50 to 70 degrees to the horizon. Its gait is peculiar in that it travels with a straight-out run and does not waddle or roll like the ordinary duck. In general appearance and shape when in motion, it has, not inaptly, been likened to a soda-water bottle set at an angle of 50 to 60 deg., a character which is best seen in a front or semi-front view. When startled, standing at attention, or trained in the show pen, it assumes an almost perpendicular pose or attitude.

Weight.—Drakes, 3½ lb. to 5 lb.; length 26 inches to 32 inches. Ducks, 3 lb. to 4½ lb.; length 24 inches to 28 inches. The above are fair standard weights and lengths, but must count for nothing if not accompanied with type and well-balanced proportions.

There are three varieties—Fawn, Fawn and White, and the White.

THE KHAKI-CAMPBELL DUCK.

General Characteristics.

This is a moderately small breed, the body being wide and fairly deep, with slightly upright carriage and finely-shaped head and neck. In the male the bill is green (the darker the better), the head, neck, stern, and wing-bar bronze, and the rest of the body an even shade of khaki or dark buff, with dark orange legs and feet. In the female the bill is greenish-black, the plumage being khaki or dark buff all over, with even ground colours while the back and wings are laced with a lighter shade of buff, and the legs are dull orange, both bill and legs being several shades darker than in the drake. Lightish feathers in the wings are allowed, but white bibs are untypical, as are yellow bills. Khaki-Campbells are tame and tractable creatures, and prolific layers of white eggs.

Weight—both sexes, 4½ lb.

THE DUCK-YARD SITE.

The selection of a site for duck raising as a commercial venture should receive very careful consideration, based on the water supply, the nature of the soil, available foodstuffs and the market for the products.

An abundant water supply is essential. A small running creek is quite satisfactory if the ducks can be kept within an enclosure during their laying period, and if all precautions are taken against the risk of their being carried down stream during heavy flood rains. In such a watercourse, the birds may obtain much of their natural foods.

The type of soil is of great importance, the best being one of a sandy nature. Heavy soils become caked with excreta which it is incapable of absorbing even during wet weather. Consequently, disease conditions conducive to serious losses may easily be set up. Land well drained and with sandy soil and a gradual slope to a point between north and east is the best site for a duck farm.

Plate 135.
A FARM FLOCK OF KHAKI-CAMPBELL DUCKS.

A duck farm should be in close proximity to a large town in which cheap foodstuffs are obtainable and which will provide a ready market for the products of the enterprise.

The market for ducks for the table and for duck eggs is somewhat limited—both products being subject to the vagaries of popular taste and varying demand—therefore the necessity for economical feeding is emphasized.

HOUSING.

The mild climatic conditions in Queensland obviate the necessity for the construction of elaborate or costly houses for the accommodation of ducks. That does not mean that ducks can be herded profitably into any class of a house. Houses should be built similar in design to ordinary poultry-houses, a lean-to building facing north or north-east, open-fronted, with a ventilation space at the top of the back wall. Buildings so constructed will afford the ducks most protection against prevailing winds and rains, while at the same time the sun's rays penetrate into the house.

Construction.—The building need not be deeper than 5 feet, and the roof could be 6 feet high at the front and 5 feet high at the back, and a ventilation space of 3 inches at the top of the back wall would be satisfactory. In estimating the size of the building, allow 2 square feet of floor space for each duck; thus, a building 10 feet long and 5 feet deep will accommodate twenty-five ducks. The best materials for the construction of duck houses is sawn hardwood and galvanised corrugated iron. Some may desire to make use of bush saplings so as to have cheaply constructed buildings; this may be done, but it is essential to have an iron roof.

Floors.—The floor of the house should be dry at all times; a damp or wet floor in a duck house may cause many deaths among the flock, while practically the whole flock will receive a check in growth or production. To ensure dry floors, build up the floor at least 4 inches above the level of the surrounding land; also excavate drains on the highest side of the house, so as to carry away storm water. Concrete floors are best, but an earth floor which has been tamped down fairly hard will be satisfactory. To facilitate cleaning, cover the floor with coarse sand or a litter of hay, grass, or straw. The litter will provide bedding for the ducks. Nests should be placed on the floor against the walls.

BREEDING.

It will be found most profitable to adopt the same breeding season for light-breed ducks as generally adopted for other poultry—namely, June to September. Ducks hatched during these months will commence laying when egg values are high, and continue for about twelve months before moulting. Heavy breeds hatched during June, July, and mid-August, will be more profitable, as they can be marketed in prime condition for the Christmas trade. The breeding of heavy breeds may be continued throughout the year, providing that a constant supply of cheap suitable foodstuffs is available.

Selection and Mating.—Care should be exercised in the selection of breeding stock. Special attention should be given to type and size. A careful study of the description of the breed is necessary, so as to be able to select birds reasonably true to type. Ducks tend to detoriorate very

rapidly in size; therefore, it is essential to maintain size of body when selecting breeding birds. In this regard, it is a good practice to weigh the birds before placing them in the breeding pen. Defective ducks should not be used for breeding. In mating, the number of females to mate with each male varies with the age of the drake, size of run, whether the birds have access to a swimming pool, and the breed. On an average, mate between six and eight ducks with each light-breed drake, and from four to six ducks with each heavy-breed drake. The number of ducks may be increased if the drake is young and very vigorous. Ducks may be safely bred from until they are three or four years old.

Plate 136.
The Proper Way of Holding a Duck.

MANAGEMENT.

Ducks should be kept apart from fowls, as they are greedy feeders and often prevent fowls from obtaining sufficient food. Their way of feeding is also slightly different. Ducks also make the drinking water unsuitable for fowls. A swimming pool is not a necessity, but where ducks have access to a pool they keep in better health, their plumage is cleaner, and they are freer from external parasites. Moreover, a higher degree of fertility results if breeding birds have access to a swimming pool As the duck usually lays in the night or early morning, it is necessary to confine them to the run or house until about 9 a.m., otherwise many eggs may be laid in the pool.

Ducks should have a constant supply of clean, cool, fresh water, and when confined during the night water should be supplied. The water vessels should be deep enough for the duck to submerge its head.

Ducks are naturally clean in their habits, but if kept in a small enclosure improperly drained, filthy conditions will result. Therefore, strict sanitation should be practised.

When kept in large numbers, ducks, particularly Indian Runners, are very excitable and easily frightened; if frightened they are very liable to go into a partial moult.

INCUBATION.

It is the usual practice not to set the first batch of eggs laid by a duck, these being often infertile; also, if fertile, weak ducklings are usually hatched from such eggs.

The period of incubation is 28 days for all breeds, with the exception of Muscovy eggs which take 35 days to hatch. The incubation of duck eggs is best done with ducks. If broody hens are used, it will be necessary to sprinkle the eggs with water daily. Also sprinkle water on the ground close to the nest, for when the hen comes off she will dust-bath, and her feathers will be moistened when she returns to the nest. Best results are obtained when the eggs are placed in an earth nest as the warmth of the hen's body will draw moisture up to the eggs and assist in maintaining the essential moisture for incubation. The duck, however, will moisten her feathers sufficiently before returning to the nest. With artificial incubation, the temperatures should be about 1 degree lower than that for hen eggs—namely, 102 degrees. After setting, the eggs should not be disturbed for 48 hours. Following this period they should be turned twice daily, and cooled daily. Each time the eggs are turned, before being returned to the machine they should be sprinkled with warm water. This sprinkling is essential, because the eggs require a lot of moisture. Test, and remove all infertile eggs. Do not open the machine after the ducklings commence chipping until the hatch is complete. Ducklings take longer to break out of the shell than chickens.

REARING.

Ducklings are very hardy, and easy to rear, therefore rearing may be done by artificial methods. Any type of a simple brooder that will permit of water being kept within access of the ducks will be satisfactory. For instance, a frame with four legs about 6 inches high to which is tacked a piece of hessian from which flannels hang to within an inch of the ground will give results. First place plenty of straw on the floor and then put down the brooder; the ducklings should be kept under the brooder the first day without food or water. To confine them, use inch netting close up all around the brooder. By adopting this practice they will know where to go when feeling cold. The following night they may be allowed 8 or 10 inches around the brooder, and in this space place water vessels. After about a week, it will not be necessary to confine them to the brooder. At about three weeks the brooder may be removed, providing that ample straw is placed in the shed. One important point should not be overlooked, and that is ground draughts should be prevented. Every day the straw should be forked up and, if necessary, replaced with clean, dry straw. Ducklings should not be crowded; best results will be obtained by rearing ducklings in small units. When about four weeks old they may be placed out in houses, for they do not then require much attention apart from plenty of food and water. Ducklings should be protected from the sun until they are well feathered on the head and neck; this is more important with Indian Runners than with other breeds. Therefore, the rearing pens should have a number of shade trees growing in them; if not, artificial shade should be provided.

FEEDING.

Ducklings require no food for 48 hours after hatching. During this period they may be supplied with water, coarse sand, and charcoal or wood ashes.

The following are mashes which will give excellent results:—

Foodstuff.	First Meal to 4 Weeks. Alternative Rations.		After 4 Weeks. Alternative Rations.	
	a	*b*	*a*	*b*
	Lb.	Lb.	Lb.	Lb.
Maizemeal	8	10	10	45
Pollard	10	..	55	..
Bran	..	..	25	..
Wheatmeal	..	7	..	45
Meatmeal	..	1	10	15
Dried Buttermilk	2	2	..	..
Bonemeal	2	2	1	1
	Oz.	Oz.		
Salt	2	2	1	1
Cooked vegetables or chaffed greenstuff	..	..	25	25

Because of the present shortage of pollard and bran, alternative rations are given which exclude these commodities.

Dissolve the salt in the liquid to be used for mixing the mash.

If these ingredients are mixed together, the amount for each meal may be moistened as required. If available, 3 lb. of curds may be substituted for the dried buttermilk, thus cheapening the ration. Skim milk is excellent for ducklings; it can be used to moisten the mash, but do not give it in the form of a drink. If there is ample milk available, allow it to curd and strain off the whey, then feed the curds. Imitate nature as far as possible by giving several small meals daily to young ducklings. A little and often is a good motto. When four weeks old, they may be fed on a similar ration to the mature ducks. When mature, it is only necessary to give them three meals daily, supplying as much food as the ducklings can consume in about half an hour. Be sure they have a big evening meal.

Plate 137.
RUNNER DUCKS SHOULD BE CAUGHT BY THE NECK.

Grown birds should receive two mashes daily, a small meal of whole maize could be fed to breeders in addition.

For the fattening of ducks, consideration must be given to the availability of cheap foodstuffs, which are often obtainable in the form of potatoes, pumpkins, and other vegetables; these should be boiled and may be added to the mash making up to 40 per cent. of the bulk. Chaffed greenstuff should be included, but do not add much greenstuff when making use of a large proportion of other cheap foodstuffs, otherwise the mash may be too bulky.

Always keep a supply of shell grit and coarse sand in receptacles before the birds. Ducks consume a large quantity of sand which is most beneficial as an aid to digestion, thereby enabling them to assimilate most of the nutriments contained in the foodstuffs.

WATER.

Water is one of the biggest factors in successful duck-keeping. Ducks should always have access to plenty of clean, cool, fresh drinking water. The water vessels or pool should be sufficiently deep to permit the ducks to submerge their heads. The water vessel should be kept under a shade tree or protected from the sun by providing shade. In rearing ducklings, it is a good plan to put a number of stones in the water vessels; this prevents the ducklings swimming and wasting the water.

Water vessels should be constructed so the ducklings can get out easily in the event of their swimming in the vessels, otherwise they may drown through cramp. This cramping is more likely to occur during cold weather.

COMMON TROUBLES.

As stated previously, ducklings are hardy and easily reared, but losses will occur if they are neglected. The most common troubles are chills and staggers.

Chills.—Symptoms—Watery eyes and nostrils. Cause—Wet or damp sleeping quarters.

Remedy—Keeping the floors dry is most important. The drinking water may be slightly coloured with permanganate of potash, and changed several times daily.

Staggers.—Symptoms—Ducklings stagger about and fall on their backs before dying. Cause—Lack of water. When water is supplied after there has been a shortage, the ducklings gorge themselves, bringing about this condition.

Remedy—Keep a constant supply of drinking water available for the ducklings.

A SPECIAL RADIO SERVICE FOR FARMERS

★ ★

The COUNTRY HOUR, a special service for farmers, is broadcast DAILY through the National and Regional Stations from 12.15 to 1.15 (mid-day)

ANIMAL HEALTH

The Use of Phenothiazine for the Treatment of Worms in Cattle.

By F. H. S. ROBERTS, Animal Health Station, Yeerongpilly.

PRIOR to the introduction of phenothiazine, the drenches usually recommended for the removal of worms from cattle were bluestone, bluestone and nicotine sulphate and tetrachlorethylene. Research on the use of worm drenches for sheep has received considerable attention, whilst comparatively little work along these lines has been carried out with cattle and these recommendations are based largely on the efficiency of the above drenches against the worm parasites affecting sheep.

The most harmful worm parasites of sheep and cattle occur in the fourth stomach and in the small and large bowel. The success of drenches containing bluestone in sheep depends on the fact that the bluestone closes the oesophageal grove and the drench is swallowed into the fourth stomach. The use of bluestone enables the drench to reach the fourth stomach in full strength. In the absence of bluestone, the drench in most animals is swallowed into the paunch and by the time it reaches the fourth stomach has become too diluted to be effective. Whether or no bluestone has a similar action in cattle remains to be determined. The evidence at the moment indicates that the oesophageal grove in these animals fails to respond to this drug. Some authorities claim that sodium bicarbonate will stimulate the closing of the grove in cattle, thus enabling drenches given after dosing with this chemical to be swallowed directly into the fourth stomach, but adequate proof of this has yet to be obtained.

In cattle, bluestone has been recommended for the large stomach worm; bluestone and nicotine sulphate for stomach worms, tapeworms, and small intestinal worms; and tetrachlorethylene for stomach worms and hookworms. To be effective, however, these drenches, as previously pointed out, must be swallowed directly into the fourth stomach. At the present time, we have no certain way of inducing this action; until we have, these drenches cannot be considered highly efficient.

Phenothiazine is very effective not only against stomach worms and small intestinal worms, but is the only drug known which has an efficient action against the nodule worms in the large bowel. Hookworms are apparently more resistant to it than the other parasites, but it would appear that even these can be controlled by using large doses. Phenothiazine has no action against tapeworms, but these parasites are, in general, of little importance. Furthermore, the

efficient action of phenothiazine is independent of the route taken after it is swallowed. In so far as cattle and sheep are concerned, there is no doubt that phenothiazine approaches more closely to the "ideal" drench than any other drench so far introduced.

The Importance of Worms.

In this State, serious losses from worm infestation are common and widespread. These losses are experienced in both dairy and beef cattle and are most frequently seen in the coastal and sub-coastal districts. The most important factors which govern the development and survival of worms in the pastures are warmth and moisture, whilst the heavy rate of stocking which is encountered in these districts makes it an easy task for the larval worms in the pastures to gain access to their cattle host.

Young animals up to 18 months, and sometimes 2 years, of age, are most severely affected, calves being especially susceptible. In Queensland, as in many other countries, worm infestation takes its greatest toll during the period extending from the autumn to the early spring. As might be expected where a number of animals are grazing together in the same pasture, losses from worm infestation usually take the form of outbreaks in which a number of animals is involved.

The Important Species of Worms

There is a large number of different species of worms which infest cattle. Many of these are of little importance and may be ignored. Those which cause the most serious damage include:—

1. The Large Stomach Worm.—This is a conspicuous species up to $1\frac{1}{4}$ inches long occurring in the fourth stomach. The female is red and white spirally striped and is frequently called the "barber's pole" worm. It is readily seen when the fourth stomach is opened and when in large numbers occurs in tangled masses.

2. The Small Intestinal Worm.—These are small, pinkish, worms up to $\frac{1}{3}$ inch in length, which infest the first 20 to 30 feet of the small bowel. On account of their small size they are very difficult to see, but if scrapings are taken from the intestine wall and examined in water in a glass dish held over a black background, they can be detected.

3. Hookworms.—These are stout, whitish, worms up to an inch in length occurring in the first few feet of the small bowel. The mouth of this worm is provided with a number of teeth, by which it adheres firmly to the intestine wall.

4. Nodule Worm.—Also a stout whitish worm, this species is found in the large bowel. The worms lie closely against the bowel wall.

5. Lungworm.—This species is found in the air tubes of the lungs. It grows up to 3 inches and more in length, and when in large numbers, almost chokes the air passages.

How Cattle become Infested.

The female worms in the animals lay eggs which pass out in the dung. Under suitable conditions of temperature and moisture, a tiny, larval worm develops in the egg, which eventually hatches. The larva

lives freely in the soil and vegetation and in the course of a few days is ready to infest the calf. To do this, it crawls up the grass, when the grass is wet with dew or rain, and is swallowed as the animal grazes. The hookworm larva can infect its host also by boring through its skin. Once it reaches its destination within the body, the fourth stomach, the intestine or the lungs, the larval worm settles down and grows to maturity.

Symptoms.

The most common symptoms of a heavy infestation is a gradual loss of condition. This is frequently accompanied by diarrhoea. The membranes lining the mouth and eyes may lose their healthy pink colour and become white. The coat becomes dry and harsh and the animal has a hide-bound appearance. Dropsical swellings under the jaw may be seen (bottle jaw) and the animal may become pot-bellied (Plate 138). Whilst the appetite frequently remains good, the animal eventually becomes too weak to stand or move about and finally dies. Infestations of lung worms sometimes accompany large numbers of worms in the fourth stomach and intestines and in such cases the presence of the lungworms is denoted by frequent coughing and difficulty in breathing.

Plate 138.
TYPICAL APPEARANCE OF A CALF HEAVILY INFESTED WITH WORMS.

Treatment.

When animals have been permitted to reach the stage when they are showing marked symptoms of infestation, they should be treated twice with phenothiazine with an interval of 10 to 14 days between treatments. Every calf and yearling in the affected herd should be treated and not only those which are showing symptoms. The paragraphs on the use of spelled pastures and nutrition should be studied carefully (see p. 375) and the measures discussed here put into operation.

Many cattle owners consider the poor condition of the young stock during the winter as a sequence to the state of the pastures. The thought that worms may play a big part does not present itself until

the animals are visibly wormy. Large numbers of worms are picked up during the warm moist weather of the summer and early autumn. Whilst the cold and dry conditions of winter considerably delay development of the larvae in the pastures and may cause heavy mortalities among them, the close grazing by the animals at this time of the year makes whatever larvae remain more accessible to the cattle. This means that whilst the bulk of the infestation takes place during the summer, some infestation also occurs during the winter particularly in those localities where the temperatures are mild.

It is therefore advisable to test all young stock

(a) in the autumn about March or early April;

(b) in June or July;

(c) in September.

The treatment in March or early April should remove the majority of the worms picked up during the summer and allow the animals to enter the winter fairly worm free. In very wormy areas, two treatments with a 10 to 14 day interval are advised. The second treatment in June or July would take care of worms which survived the earlier treatment or have been picked up since. The September treatment is advisable for with the three treatments plus the unfavourable effect of the cold and dry conditions on the larvae in the pastures, both the animals and the pastures will enter the spring with only very small infestations.

Administration of Phenothiazine.

Phenothiazine is available under the trade names of Phenovis, Phenzeen and Phenoveen and may be purchased from any firm which deals with supplies for the farmer or grazier. The dose rates are as follows:—

Animals—

2 to 4 months	½ oz. phenothiazine
4 to 6 months	¾ oz. phenothiazine
6 to 12 months	1 oz. phenothiazine
12 to 18 months	1½ oz. phenothiazine
over 18 months	2 oz. phenothiazine

Phenothiazine is not soluble in water, but can be suspended in water to be given as a drench. Weigh out the total amount of phenothiazine required to treat all the animals in the herd. Pass the powder through a sieve to remove all lumps. A kitchen flour sifter is very suitable for this purpose. Measure out 12 fluid oz. of water for each one pound of phenothiazine. Pour the water on to the powder gradually, stirring vigorously to form a thin paste. The doses of this fluid containing the amounts of phenothiazine set out above are then—

2 to 4 months	¾ fluid oz.
4 to 6 months	1⅛ fluid oz.
6 to 12 months	1½ fluid oz.
12 to 18 months	2¼ fluid oz.
over 18 months	3 fluid oz.

The above suspension is, in some quarters, considered too thick to use without some difficulty. A thinner suspension may be made by mixing 16 fluid oz. of water with each pound of phenothiazine. The dose rates of this mixture would be—

2 to 4 months	1 fluid oz.
4 to 6 months	1½ fluid oz.
6 to 12 months	2 fluid oz.
12 to 18 months	3 fluid oz.
over 18 months	4 fluid oz.

Starvation is not required either before or after treatment. The suspension may be given either with a drenching gun or with drenching funnels. The mixture must be kept well stirred during drenching otherwise the phenothiazine will sink to the bottom. There are drenching guns which are especially designed for phenothiazine. These may clog after some use but this can be avoided by frequent washing with water.

Ill effects are sometimes seen in cattle after using phenothiazine. Reports have been received of an eye condition resembling blight following drenching with this drug. This effect, however, soon disappears. It is thought to be due to exposure to sunlight after treatment. The urine may be stained red for some days, but this is of no importance.

Nutrition.

The importance of nutrition in the control of worm parasites is shown by the fact that during the summer months when the pastures are at their best outbreaks are relatively few; whilst during the winter, when the pastures are poor, outbreaks are common and widespread. Supplementary feeding during the winter months would play a very important role in controlling worm parasites. Again where phenothiazine is used to treat animals showing marked symptoms of infestation, treatment should be followed by supplementary feeding to assist the animals to recover. Frequently, treatment of heavily infested animals may not be followed by any marked improvement in their condition, simply because, although most of the worms have been removed, the animals are unable to obtain sufficient nourishment from the pastures to repair the damage caused by the infestation.

The Value of Spelled Pastures.

Although some larvae can survive in pastures up to 12 months and more, a large percentage will die in 4 to 6 weeks unless they gain access to cattle. This is particularly the case during the dry winter months. Little benefit may be gained from treatment if the animals remain in a heavily contaminated pasture and the owner who can move his young stock after treatment into a pasture which has been spelled from cattle for 4 to 6 weeks has a decided advantage in his fight against worm parasites. One reason for the outbreaks which occur year after year is the use of permanent calf pastures. Subdivision of the land so that several pastures can be set aside for the young animals, each pasture being used only after it has been free of cattle for 4 to 6 weeks, will greatly assist in protecting the young stock. Pastures being spelled could be grazed by horses, as the worms infesting the horse cannot establish themselves in cattle and vice versa.

Finally, in selecting calf pastures well drained land, free from swamp, should be given preference.

GENERAL NOTES

Army Buildings for Experiment Stations.

Executive approval has been given for the purchase through the Disposals Commission of buildings and equipment at Kairi State Farm for use on departmental experiment stations. The buildings referred to are on the Kairi State Farm, which is to be opened as a Regional Experiment Station when vacated by the Army. The equipment was used on the farm during Army occupancy.

Staff Changes and Appointments.

Mr. P. L. Pfrunder (of Pozieres, via Cottonvale) has been appointed an Inspector under the Diseases in Plants Acts.

Mr. S. B. Myles, Inspector, Division II., Division of Animal Industry, Cadarga, has been transferred to Brisbane, and Mr. S. J. B. Prior, Inspector, Division II., on probation, under *The Diseases in Stock Acts, 1915 to 1944*, and under *The Slaughtering Act of* 1898, has been transferred from Brisbane to Cadarga.

The position of Inspector, Division I., Division of Animal Industry, Maryborough, has been gazetted, and action will be taken to fill this position.

Correspondence Course in Pig Raising.

The Department of Agriculture and Stock offers to persons interested in pig raising a free course of instruction by correspondence. This course comprises forty-eight lessons, one or more of which may be completed each week, according to the time available for study.

The lessons cover breeds, selection of stock, breeding, feeding, management, and marketing; plans of piggery equipment and notes on pig feeds also are included. There is also a section dealing with slaughtering and farm curing of bacon.

Farmers, farm workers, or those interested in rearing pigs but not farming, may enroll by forwarding a written application to the Under Secretary, Department of Agriculture and Stock, William street, Brisbane.

ANSWERS.

(*Selected from the outgoing mail of the Government Botanist.*)

Caustic Poison Plants.

H.S. (Wyandra)—

Your specimens are often referred to as Bottle Tree Caustic. The botanical name is *Euphorbia eremophila*. Feeding experiments with cattle and sheep in New South Wales produced only slight diarrhoea. At Yeerongpilly Animal Health Station a sheep was force-fed with several pounds of this plant, but no poisonous effects were noticed. However, we have had reports that this plant causes symptoms similar to those brought about by the Creeping Caustic (*Euphorbia Drummondii*), such as intense swelling of the head and neck.

One of the Bottle Tree Family.

A.F.M. (Yeppoon)—

Your specimen came from the tree which is known botanically as *Sterculia quadrifida*. This is found in the rain forests from northern New South Wales up to Thursday Island. Neither the seeds nor the leaves are known to be poisonous to animals. As a matter of fact, the seeds have been roasted and ground as a substitute for coffee.

Rural Topics

This isn't Udder Nonsense.

It was no "udder nonsense" that was dished out in a recent release by the Wisconsin Department of Agriculture on importance of protecting the udder of the modern milk cow.

A 10-point "udderance" set forth the following:—

1. To be successful a dairyman must be udderwise.
2. All that a dairyman is he owes to udders.
3. Many udder facts need to be known.
4. While feed is important, milk is made from udder materials.
5. Don't expect good result from a cow that is udderly neglected.
6. Many cows are udderly ruined by poor milking.
7. Udder injuries produce mastitis.
8. Be considerate of udders and the reward shall be yours.
9. Do unto udders as you would have them return unto you.
10. The cow's udder is the biggest money bag in Wisconsin agriculture.

But the udder part of the news release was in a serious mood. It pointed out that in the development of the modern milk cow, capacity in some cases had been increased 1,000 per cent. Whereas a native or range cow gives from 5 to 10 lb. of milk a day, a good dairy cow can produce as much as 100 lb. each twenty-four hours.

The great increase in productivity subjects the udder to a great deal of strain, making it more susceptible to injury and disease.

The small udder of the native cow is protected by her flanks, which offer but little protection for the much enlarged udder of the well-developed dairy cow.—*National Butter and Cheese Journal* (U.S.A.), Feb., 1946.

Is Our Soil a Vanishing Asset?

A recent addition to the central library of the Department is *Food or Famine—The Challenge of Erosion.* The author, Ward Sheppard, has specialised in large-scale enterprises of soil, forest, and water conservation in the United States and is now a conservationist in the Indian Service. He asks can civilisation conquer soil erosion before soil erosion destroys civilization? This book is no mere catalogue of destruction. Starting from the basic fact that world-wide soil erosion is an ominous threat to civilisation, he raises and systematically answers the question, what are we going to do about it? Rejecting sentimental propaganda, he advocates as the first step the continent-wide organisation of land management districts, with expert guidance, to apply scientific management to our farms, forests, and grasslands.

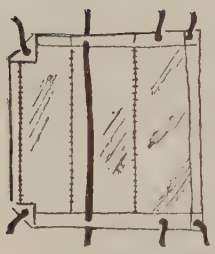
Erosion is definitely one of our fundamental farming problems. The kind of answer we give to its challenge will spell the difference between food and famine, between a civilisation of stability, vigour, and economic balance; and a civilisation like "a gaudy excrescence on top of a rotting foundation."

We often hear the term the "conquest of nature." As a matter of fact, we don't conquer nature. The best we can do, says the author of *Food or Famine*, is to co-operate with nature on the terms and conditions set by nature—that is, if we are clever enough to learn all about nature's ways and enter into a two-way bargain with her. Nature has the whip hand, anyhow. It is no use trying to rob her of riches without replenishment and expect to get away with it. Otherwise, erosion, floods, droughts, and the silting up of river systems will be the penalty—a penalty which, in the end, means stark starvation. War and erosion are the twin scourges of civilisation, and it's a remarkable thing and a sobering thought that with all his thousands of years of civilisation, man has not yet mastered either of his two main jobs: making peace with nature, or making peace with his fellow-man.

The obvious moral of all this is that we must restore our sense of soil and recognise it as a living organism. A farm is not a factory, nor should the farmer be just a food mechanic. If we think and act along those lines, however, nature will surely take revenge. Conservation must become the core of our agriculture.

GADGETS AND WRINKLES

COW RUGS FROM CORNSACKS.

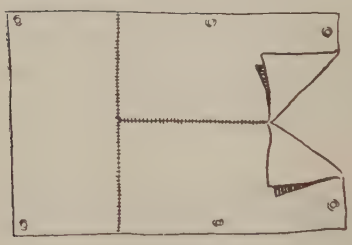


Useful cow rugs can be made from old cornsacks, as illustrated.

Three bags are used in the manner shown—this giving double thickness—but if only lightweight rugs are required, 1½ bags will do.

The sketch will show the arrangement of the bags—straps or rope is used to go through the holes shown; one advantage being that one strap goes right across and round the body just behind the forelegs and shoulder so that the rug will stay in place. In both this and the following idea, the straps or ropes would be more easily and quickly handled if some small coupling arrangements were fixed to the ends so that they could be quickly fastened.

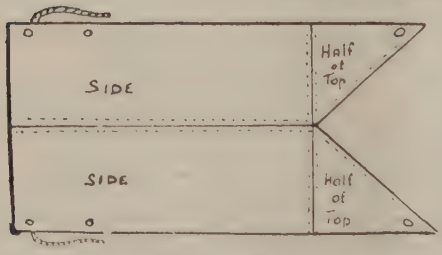
ANOTHER COW RUG.



This is somewhat similar—3 bags being used, but this time the two sides are sewn only as far as indicated in the sketch; the balance of the sacks being turned down as shown in order to fit round the neck and chest.

Straps, cord or rope is tied through the holes indicated—the middle ones going right round the girth—the back ones connecting across the hind legs and the other two meeting across the chest. One way of keeping the rug in place is to fix extra wide straps or material round the girth, whilst other straps could be added where necessary.

COW RUGS FROM WOOLPACKS.



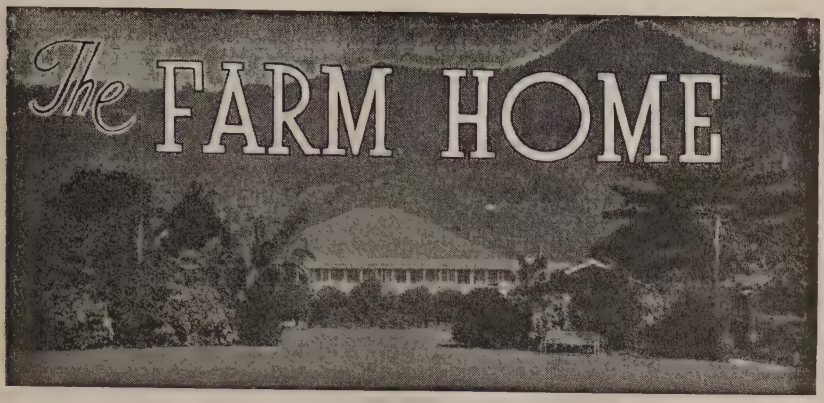
This sketch shows one way of doing this; one pack making two rugs.

The best way to cut the top and the bottom of the pack is to make one cut of each, straight from corner to corner, and then to fix as indicated. This type is quickly and easily made and will be found quite serviceable for all normal requirements.

HOME-MADE BAGGING NEEDLES.

Home-made needles can be made as shown here—this particular one being made from an ordinary sardine tin opener.

The handle of the tin-opener is straightened out, then hammered almost flat, after which it is filed or ground sharp and bent to the desired curve. At the opposite end, the slot to form the eye will need to be opened slightly with a chisel.



Care of Mother and Child.

Under this heading an article supplied by the Maternal and Child Welfare Service of the Department of Health and Home Affairs, dealing with the welfare and care of mother and child, is published each month.

A SNEEZE HAS BEEN PHOTOGRAPHED.

THE season of colds is with us again and with it the people, who through ignorance or carelessness, infect their own children, and other people's children, with colds by coughing and sneezing into the atmosphere. An ordinary sneeze will project into the air many thousands of droplets laden with germs at an initial velocity of 150 feet per second. This has been proved by the ingenious method of flash photographing a sneeze; by this means also it was shown that a large number of germs carrying droplets from this sneeze were small enough and light enough to remain suspended in the air for over 15 minutes. This means that any person within 4 feet and at the same height as the sneeze may become infected with a cold. Travelling in the train recently a Child Welfare sister felt very nervous for a bright little child of three sitting on her mother's lap next to a person who coughed explosively into the air for the whole 20 minutes journey, and did not use a handkerchief once because she was knitting. *Don't forget that the little cold of the big person may mean a big cold in a little person.*

Of the 1,014 babies and children who died last year before reaching the age of five years, 116 died from infections, which affect the nose, throat, bronchial tubes, and lungs, and many of these would commence with just a common cold. The sickness rate was, of course, much higher. Knowing this it is the duty of every father and mother to learn about these infections, so that they can not only protect their own children from them, but help to lessen the number of other children who contract them, and so prevent much unnecessary illness and suffering among the little ones.

The first thing we have to realise is that the reason colds and similar infections are so prevalent in the winter is because buildings and public vehicles are closed up to keep out draughts, and so there is no moving current of air to blow away the germ-laden spray from sneezes and coughs.

The trouble is that so many people accept the common cold as inevitable and not much to worry about, and do not realise that it is highly infectious and is often the forerunner of bronchitis and pneumonia.

How to Prevent Colds.

1. First we must develop a public health conscience in our community by teaching people the danger to others associated with sneezing and coughing without covering mouth and nose with a handkerchief.

2. Practise what we preach. Show our children, by example, the importance of clean habits.

3. Strengthen the children's natural defences by keeping them out of crowds and giving them plenty of fresh air and sunshine, the commonest, cheapest and most precious things around us. Fresh cold air does children good if they are warmly clothed. "Bottled Sunshine" (Cod Liver Oil or Emulsion) should be given if the weather is dull or wet.

4. See that the children have a nourishing and vitamin-rich diet. The sister at your Welfare Centre will advise you about this.

5. Dress the children according to the temperature of the day, not the time of the year.

6. See that they have a long unbroken sleep each night and a day-time nap or rest as well.

Any further advice on this or any other matter can be obtained by communicating personally with the *Maternal and Child Welfare Information Bureau*, 184 *St. Paul's Terrace, Brisbane*, or by addressing letters, *Baby Clinic, Brisbane*. These letters need not be stamped.

IN THE FARM KITCHEN.

Cheese Pancakes.

Use 8 tablespoons flour, 4 eggs, 4 tablespoons grated cheese, salt, enough milk to mix it into a fairly thick paste. Mix the flour and half of the cheese, whisk egg yolks well, add salt and milk, add this to the flour mixture, then add well-beaten egg whites. Bake a light brown, sprinkle with the other half of the cheese, roll, and serve while hot.

Banana Fritters.

Take 1 cup of mashed bananas, the juice of half a lemon, ½ cup of flour, 1 teaspoon of baking powder, 5 tablespoons of sugar, an eighth of a teaspoon of cinnamon, 1 egg, ¼ of a cup of milk. Add the lemon juice to the mashed bananas, then add the sifted dry ingredients. Add the egg yolk and milk. Fold in the stiffly-beaten egg white and mix into a stiff dough. Drop into hot fat and fry until brown.

Turnips.

When boiling turnips add a teaspoon of sugar but no salt. This tends to make them soft and smooth, instead of stringy. To glaze: Boil turnips in salted water for 10 minutes, then drain. Melt 2 oz. butter in a baking dish; cut turnips in halves and place in dish. Sprinkle the tops with salt, pepper and sugar. Bake in slow oven until brown, stirring frequently, then add some milk or stock and continue to cook until tender and glazed. Baste frequently.

Curried Beans.

Take 2 cups haricot beans, 1 apple, 2 tablespoons butter, 1 dessertspoon curry powder, 1 onion, 1 carrot, 1 cup water or stock, tomato sauce. Soak beans overnight in cold water, drain, place in saucepan with water to cover and bring to boil. Drain again, cover with boiling water, and cook till tender. Chop onion and apple, grate carrot, fry together in the butter and put in saucepan with 1 cup of stock from the beans. Stir in currypowder blended with water, add salt and tomato sauce and simmer 10 minutes. Add cooked beans and serve very hot.

Carrots.

Melt 3 tablespoons butter, and in it slightly brown an onion. Add 2 cups cold sliced carrot, mix well, add pepper and salt, and cook till butter is absorbed. Sprinkle with parsley. Young carrots are nice if parboiled, then put in a saucepan with a little butter, and allowed to brown. Serge with brown sauce.

Cabbage Savoury.

Use left-over cabbage for this. Also some cold cooked potatoes, which should be cut into fairly thick slices. Fry all in butter till lightly browned, turn on to a hot dish, and then fry some eggs to serve with it. If preferred fried bacon or meat may be served instead.

QUEENSLAND WEATHER IN MAY.

Rainfall over the whole State was well below average, only three Stations recording over average amounts (Thursday Island 317 points above, and in the North Coast Barron Division Archer Point 42 points above and Mossman 22 points above). The North Coast Divisions received the best distribution, due to fairly general moderate to locally heavy showers, which accompanied a persistent south-easterly stream during the second week of the month. These showers brought considerable relief to canegrowers in these divisions, but further substantial falls are now needed to maintain any growth thus induced in young crops. In other cane-growing districts, only scattered light showers and thunderstorms have been received, and any earlier hopes for a high seasonal yield will not be realised. Stations in the Carpentaria, Central Lowlands, Upper and Lower Western, Warrego, and Far South-West again, with very few exceptions, reported no rain, and the scarcity of sufficient winter feed is serious. Fears are expressed for the survival of weakened stock during the usual winter cold spells, two of which have already been experienced. In the Central Highlands, Darling Downs, and Maranoa Divisions scattered light to moderate falls, which accompanied weak trough conditions during the first and third weeks, have brought only slight relief to pastoralists. Continued lack of rain in the Burnett, Callide, and Dawson Valleys of the South Coast-Port Curtis Divisions has created drought conditions, for which State Government aid is being sought.

Pressure.—From 2nd to 7th inclusive a moderately intense anti-cyclone dominated the situation over eastern Australia, with the result that fine weather prevailed over the whole of the State except for isolated showers along the Central and North Coasts. A "low" was located at 9 a.m., 15th, moving into the Great Australian Bight area, with the anti-cyclonic belt extending over sub-tropical Australia gradually losing energy. By 9 a.m., 16th, the "low" had revealed itself as an intense closed depression centred south of the Bight and moving rapidly eastwards, being followed by an equally strong anti-cyclone. This depression continued to intensify and moved eastwards, and by 18th it had moved into the South Tasman Sea with a second small centred forming over inland New South Wales. During the passage of the depression's primary cold front through western and south-western Queensland severe dust storms occurred, the dust haze from which extended eastwards, so that by the morning of 18th the whole of the south-east quarter of the State was covered by a dust layer in which horizontal visibility was nowhere greater than 1 mile. On 19th the eastern half of the Continent was brought under the influence of a strong, deep south to south-west flow of modified Polar Air, which gave Queensland its coldest spell since last winter. The passage of secondary cold front through the south-eastern quarter of the State on 19th was accompanied by moderate falls of snow in the Granite Belt region of the Darling Downs and scattered hail storms. The depression moved rapidly across the Tasman Sea, and by 21st the whole Continent was again under the influence of anti-cyclonic control, and in the Queensland area winds quickly moderated and temperatures became milder. This control persisted until 25th, the anti-cyclone over New South Wales showing little movement and maintaining mainly fine weather over the State, except for local coastal showers. On the 26th, two small anti-cyclonic cells had formed, one over the north Tasman Sea, and the other along the northern tableland area of New South Wales extending into south-east Queensland. The individual weak circulations accompanying these two cells were sufficient to give weak trough conditions along the Central and South Coast areas on 26th and 27th when isolated evening storms were reported. At 9 a.m., 28th, an intense depression below 988 mbs. was located south of Western Australia moving rapidly eastwards, displacing the "high" over New South Wales and causing milder conditions as the winds over Queensland swung more northerly. This intense depression continued its rapid movement on an east to south-east course, with the result that a well-defined trough extended from the Tasmanian area into south-west and west Queensland at 9 a.m., 30th. The cold fronts accompanying this trough were only sufficiently active to cause local dust storms in the dry inland areas and very isolated showers on the Darling Downs as they moved eastwards. The fronts had passed the south Queensland coast by the afternoon of 31st and were followed by a renewal of a cold south-west stream over the whole of sub-tropical Queensland.

Temperatures.—May, generally speaking, was milder than usual, except during the middle and at the end of the month, when colder spells were experienced. These milder conditions were reflected by the maximum temperatures, which were above normal in all Divisions, varying from 1.1 deg. above normal at Cairns to 5.6 deg. above normal at Longreach. Minimum temperatures also were normal or above normal except in the Peninsula and South Coast-Curtis Divisions, where they varied from 0.8 deg. below normal at Rockhampton to 3.7 deg. below at Palmerville. In other divisions, minimum temperatures varied from normal temperature at Georgetown to 3.9 deg. above at Longreach,

The rainfall position is summarised below:—

Division.	Normal Mean.	Mean May, 1946.	Departure from Normal.
	Points.	Points.	Per cent.
Peninsula North	137	128	7 below
Peninsula South	50	11	78 "
Lower Carpentaria	38	3	92 "
Upper Carpentaria	58	Nil	100 "
North Coast, Barron	300	238	21 "
North Coast, Herbert	434	232	47 "
Central Coast, East	165	61	63 "
Central Coast, West	81	3	96 "
Central Highlands	127	12	91 "
Central Lowlands	87	10	88 "
Upper Western	51	Nil	100 "
Lower Western	69	Nil	100 "
South Coast, Port Curtis	203	51	75 "
South Coast, Moreton	349	62	82 "
Darling Downs, East	156	39	75 "
Darling Downs, West	143	6	96 "
Maranoa	137	5	96 "
Warrego	112	Nil	100 "
Far South-West	97	Nil	100 "

Commonwealth of Australia, Meteorological Bureau, Brisbane, 5th June, 1946.

ASTRONOMICAL DATA FOR QUEENSLAND.

JULY.

Supplied by the Astronomical Society of Queensland.

TIMES OF SUNRISE AND SUNSET.

At Brisbane.			MINUTES LATER THAN BRISBANE AT OTHER PLACES.					
Date.	Rise.	Set.	Place.	Rise.	Set.	Place.	Rise.	Set.
	a.m.	p.m.						
1	6.39	5.03	Cairns	9	48	Longreach	27	43
6	6.39	5.05	Charleville.. ..	25	29	Quilpie	37	33
11	6.39	5.07	Cloncurry	37	62	Rockhampton ..	2	18
16	6.38	5.10	Cunnamulla ..	30	28	Roma	15	19
21	6.36	5.12	Dirranbandi ..	21	17	Townsville.. ..	9	40
26	6.34	5.15	Emerald	12	27	Winton	30	51
31	6.31	5.17	Hughenden ..	22	48	Warwick	5	4

TIMES OF MOONRISE AND MOONSET.

At Brisbane.		
Date.	Rise.	Set.
	a.m.	p.m.
1	8.30	7.15
2	9.20	8.20
3	10.03	9.23
4	10·40	10.22
5	11.13	11.18
6	11.45	..
	p.m	a.m.
7	12.16	12.11
8	12.46	1.04
9	1.19	1.57
10	1.54	2.51
11	2.33	3.45
12	3.16	4.38
13	4.04	5.32
14	4.56	6.23
15	5.51	7.12
16	6.49	7.58
17	7.47	8.39
18	8.46	9.17
19	9.45	9.52
20	10.44	10.26
21	11.44	11.01
22	..	11.37
	a.m.	p.m.
23	12.47	12.16
24	1.52	12.59
25	3.00	1.49
26	4.08	2.45
27	5.14	3.47
28	6.14	4.53
29	7.07	6.00
30	7.54	7.05
31	8.34	8.06

MINUTES LATER THAN BRISBANE (SOUTHERN DISTRICTS).

Charleville 27; Cunnamulla 29; Dirranbandi 19;
Quilpie 35; Roma 17; Warwick 4.

MINUTES LATER THAN BRISBANE (CENTRAL DISTRICTS).

Date.	Emerald.		Longreach.		Rockhampton.		Winton.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	11	27	26	43	1	18	29	51
6	19	19	35	35	10	10	40	40
11	28	12	44	27	19	2	51	30
16	27	12	43	27	18	2	50	30
21	17	20	32	36	8	11	37	42
26	11	29	26	44	0	19	28	52
31	14	23	30	39	5	14	34	45

MINUTES LATER THAN BRISBANE (NORTHERN DISTRICTS).

Date.	Cairns.		Cloncurry.		Hughenden.		Townsville.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	7	48	36	62	21	48	8	40
3	14	41	41	58	26	43	14	34
5	24	32	47	52	32	37	21	27
7	33	26	53	47	38	33	28	22
9	43	16	59	42	44	27	36	16
11	50	9	64	37	48	23	41	10
13	53	5	67	34	50	20	44	7
15	51	5	65	34	49	20	42	7
17	44	11	60	38	45	24	36	12
19	34	20	54	44	38	29	29	18
21	23	32	46	52	31	37	21	27
23	18	42	43	58	28	44	17	35
25	9	49	37	63	22	49	9	41
27	5	52	35	65	20	50	6	44
29	8	47	37	62	21	47	8	39
31	16	39	42	57	27	42	16	33

Phases of the Moon.—First Quarter, 6th July, 3.15 p.m.; Full Moon, 14th July, 7.22 p.m.; Last Quarter, 22nd July, 5.52 a.m.; New Moon, 28th July, 9.53 p.m.

At the end of the month the Sun will rise and set approximately 20 degrees north of true east and true west respectively. On 6th and 20th July the Moon will rise and set approximately true east and true west respectively.

Mercury.—At the beginning of the month will set about two hours after sunset, about 20 degrees north of true west. At the end of the month it will set only about twenty minutes after sunset.

Venus.—In the constellation of Leo; at the beginning of the month will set between 7.45 p.m. and 8.45 p.m., and at the end of the month between 8.30 p.m. and 9.30 p.m.

Mars.—Also in the constellation of Leo, will set between 9.30 p.m. and 10.30 p.m. at the beginning of the month and between 8.45 and 9.45 p.m. at the end of the month.

At the end of the month Venus and Mars will be very close, Venus being the brighter.

Jupiter.—At the beginning of the month, will set a little after midnight and at the end of the month will set between 10.45 p.m. and 11.45 p.m.

Saturn.—Too close to the Sun for observation, being in line with the Sun on the 21st.

Star charts—

The chart on the right is for 7.15 p.m. in the south-east corner of Queensland to 9.15 p.m. along the Northern Territory border on July 15th. (For every degree of Longitude we go west, time increases 4 minutes.) The chart on the left is for 10 hours later. On each chart the dashed circle is the horizon at Cape York and the dotted circle is the horizon along the N.S.W. border. When facing north hold "N." to the bottom, when facing south hold "S." to the bottom, and similarly for the other directions.

Only the brightest stars are included and the more conspicuous constellations named. The stars which do not change their relation to one another, moving east to west, arrive at any selected position about 4 minutes earlier each night. Thus at the beginning of the month the stars will be in the positions shown about 1 hour later than the time stated for the 15th and at the end of the month about 1 hour earlier than that time. The positions of the moon and planets, which are continually changing in relation to the stars, are shown for certain marked days. When no date is marked the position is for the middle of the month.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

MAY RAINFALL.

(Compiled from Telegraphic Reports.)

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	May.	No. of years' records.	May., 1945.	May., 1946.		May.	No. of years' records.	May., 1945.	May., 1946.
North Coast.	In.		In.	In.	*South Coast—cont'd.*	In.		In.	In.
Atherton	2·34	42	4·04	2·04	Gatton College	1·53	44	1·69	..
Cairns	4·51	61	8·75	4·28	Gayndah	1·55	72	0·99	0·06
Cardwell	3·64	71	4·81	1·95	Gympie	2·91	73	1·58	0·46
Cooktown	2·76	67	3·80	1·82	Kilkivan	1·85	62	0·79	Nil
Herberton	1·72	57	2·08	1·04	Maryborough	3·01	72	2·94	1·02
Ingham	3·76	51	5·40	2·97	Nambour	5·09	47	2·75	1·11
Innisfail	12·39	62	9·33	6·68	Nanango	1·55	61	1·59	0·27
Mossman	3·10	19	6·06	3·32	Rockhampton	1·60	72	1·48	0·22
Townsville	1·24	72	0·57	0·08	Woodford	3·03	55	3·16	0·46
Central Coast.					*Darling Downs.*				
Ayr	1·09	56	0·61	0·12	Dalby	1·29	73	0·50	Nil
Bowen	1·28	72	1·77	0·99	Emu Vale	1·12	47	1·30	0·40
Charters Towers	0·78	61	0·38	0·05	Jimbour	1·21	64	0·83	Nil
Mackay	3·86	72	2·74	2·92	Miles	1·51	58	0·62	0·13
Proserpine	4·22	40	4·81	1·61	Stanthorpe	1·75	70	1·49	0·97
St. Lawrence	1·74	72	2·56	0·04	Toowoomba	2·14	71	2·00	0·17
					Warwick	1·48	78	1·90	0·41
South Coast.					*Maranoa.*				
Biggenden	1·80	44	1·38	0·35	Roma	1·42	69	0·06	0·05
Bundaberg	2·63	60	2·02	0·54	St. George	1·41	62	1·31	0·02
Brisbane Bureau	2·77	94	2·95	0·27					
Caboolture	3·27	67	2·72	0·20					
Childers	2·17	48	1·60	0·61	*Central Highlands.*				
Crohamhurst	5·04	50	4·00	..	Clermont	1·29	72	1·41	0·08
Esk	2·00	56	1·79	0·12	Springsure	1·23	74	0·97	Nil

CLIMATOLOGICAL TABLE FOR MAY.

(Compiled from Telegraphic Reports.)

Divisions and Stations.	Atmospheric Pressure Mean at 9 a.m.	Shade Temperature.		Extremes of Shade Temperature.				Rainfall.	
		Mean Max.	Mean Min.	Max.	Date.	Min.	Date.	Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Pts.	
Cairns	..	83	67	88	6	60	21	428	13
Herberton	..	74	55	80	17, 18	31	20	104	8
Townsville	..	82	62	89	18	47	30	8	2
Rockhampton	30·11	82	57	89	2	45	21	22	2
Brisbane	30·24	76	54	83	14	46	16	27	3
Darling Downs.									
Dalby	..	76	45	82	7	33	16	Nil	..
Stanthorpe	..	68	35	74	13	19	16	97	4
Toowoomba	..	70	44	76	14	30	16	17	2
Mid-Interior.									
Georgetown	29·98	88	74	95	2	45	20	Nil	..
Longreach	30·10	86	56	95	1	42	19	Nil	..
Mitchell	30·11	77	45	83	4, 5, 25, 30	31	21	10	1
Western.									
Burketown	..	88	63	95	4	48	20	Nil	..
Boulia	30·01	83	54	91	2	43	19, 21	Nil	..
Thargomindah	30·11	78	51	87	9, 10	41	22, 31	Nil	..

A. S. RICHARDS, Divisional Meteorologist.

Commonwealth of Australia,
Meteorological Bureau, Brisbane.